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Making Pistons for the Wright Engine

By FRED H. COLVIN
Editor, *American Machinist*

The third article—Cleaning the castings—Boring, facing and grooving fixtures for drilling and boring pin holes—Grinding the outside—Water testing and rolling the face

THE PISTONS used in the Wright aeronautical engine are of the solid skirt aluminum type, the details being shown in Fig. 34. They are cast in individual molds, as shown in Fig. 35. Some of the sand cores may be seen on the rack in the rear, and it will be noted that the cores for the piston-pin holes are produced by the steel pins shown in place in the molds. The temperature of the metal is very carefully tested by pyrometer before pouring, in order to secure sound castings of the proper quality.

After the sand is shaken out and the gates sawed off, the pistons go to what is called the "shimmy" machine shown in Fig. 36. Here two rows of six pistons each are clamped between the planks shown, the lower plank *A*, being attached to angles at each end, which are provided with trunnions *B*, mounted in the bearing as shown. Above the trunnions is a crankshaft *C* running the whole length of the planks and supported in inverted hangers on the floor. The inner ends of the angles are connected by rods, from which connecting rods go to the crankshaft shown above the planks.

Running the crankshaft at a fairly rapid speed, produces a short-stroke, jumping motion, which effectually jars or "shimmies" the sand loose from the piston castings. The pistons to be seen in front of this machine show the gates and the two risers which do much toward insuring clean and solid castings. It will be noted that a center projection is cast on the piston head for use in the machining operations which follow.

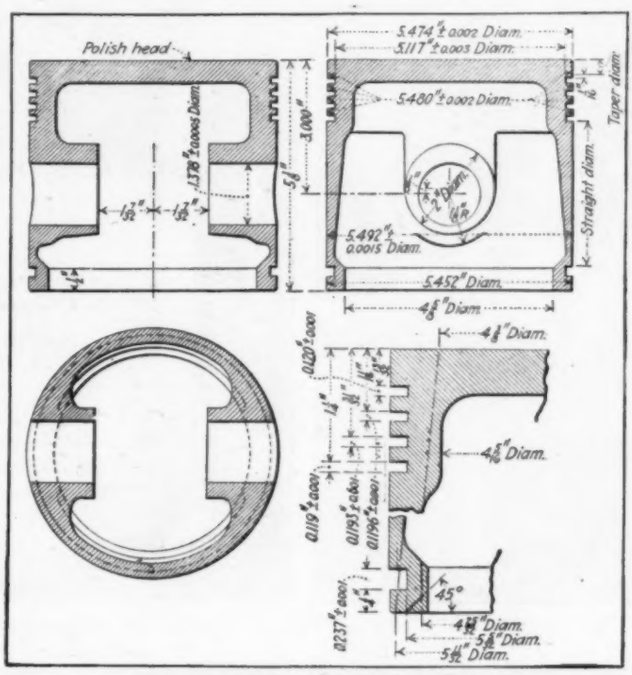


FIG. 34—DETAILS OF THE PISTON

Outline of Operations

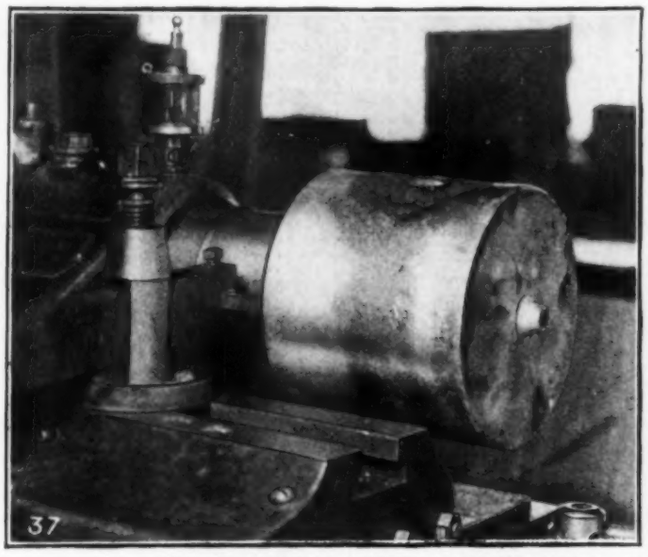
Rough face open end	Finish turn and groove
Bore open end	Rough and finish grind
Drill piston pin hole	Finish head
Rough turn face and groove	Water test to 160 lb.
Water test to 160 lb.	Roll top if necessary
Mill inside bosses	Rough and finish bore pin
Anneal to 600 deg. F.	Rough and finish bore pin hole
Face open end	Weigh and lighten if needed
Cut off end boss	

Before describing the machining operations, it will be well to examine the design of the piston itself, details of which are shown in Fig. 34. This illustration gives the main dimensions, and shows the construction of the piston with its grooves for the four narrow rings at the top and a wider or wiping ring at the bottom. It also shows the varying diameters of the piston, the portion above the upper ring being 5.474 in., the three lands 5.480 in. and the diameter at the straight part, 5.492 in., while the diameter below the wiper ring is reduced to 5.452 in. The tolerances are also shown in each case, except that of the bottom diameter.

It will be noted that the piston-pin boss or hub is ½ in. out of center instead of being concentric, thus adding to the strength above the pin so that it can better resist the impact of the explosion.

The first machining operation is to rough turn and bore the open end of the skirt on a Porter-Cable lathe, as shown in Fig. 37. The piston is held on an air operated expansion mandrel, and the illustration shows how the tool is held for boring the skirt. The open end is bored to 4.609 in., with a minus tolerance of 0.001 in., and the end is chamfered to 45 deg. The

FIG. 35—CASTING ALUMINUM PISTONS. FIG. 36—CLEANING IN THE SHIMMYING MACHINE



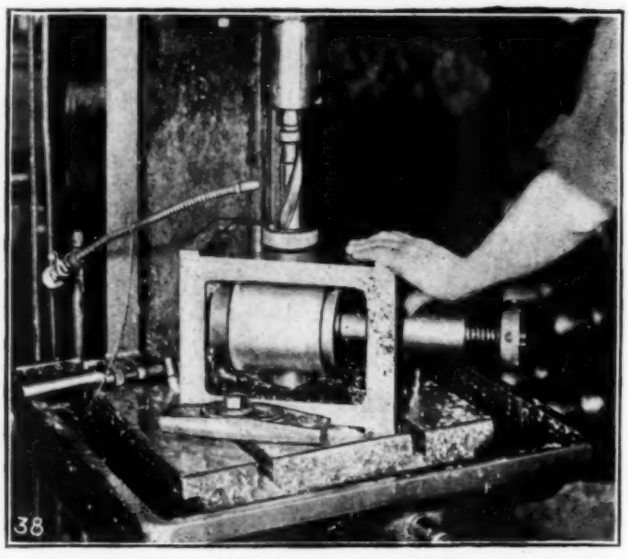
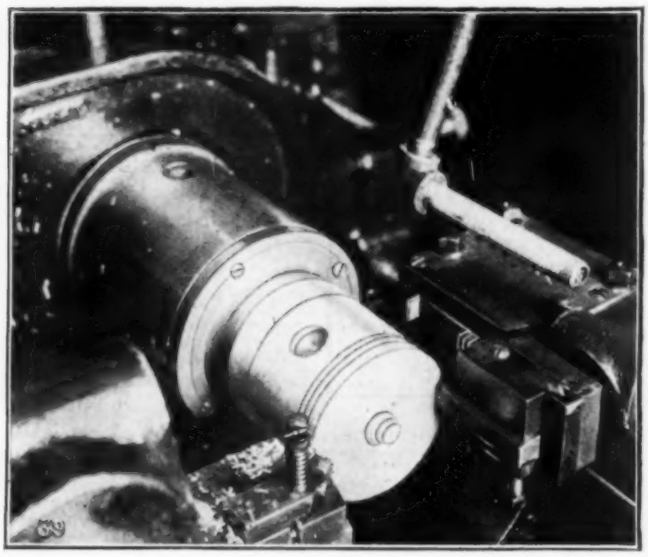


FIG. 37—BORING AND FACING OPEN END. FIG. 38—ROUGH DRILLING PISTON PIN HOLES



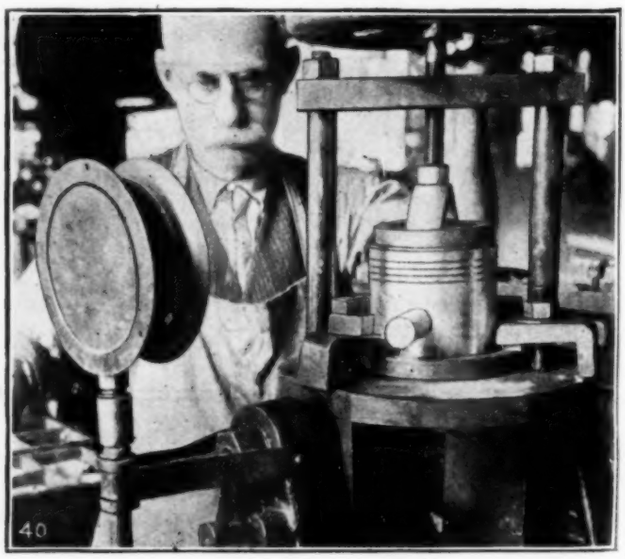


FIG. 39—ROUGH TURNING AND GROOVING. FIG. 40—TESTING WITH WATER PRESSURE

small tolerance allowed in the roughing operation is because the open end is used for locating the piston in future operations.

The piston then goes to the single-spindle drilling machine shown in Fig. 38, where the pin hole is drilled through with a 1⅝ in. drill and the alignment of the hole checked. It is important that the spring equalizer on the fixture work freely against the piston-pin hub, as otherwise the pin holes may not be central with the boss. Then the piston goes to the Pratt & Whitney automatic piston-machine, shown in Fig. 39, the piston being held by the pin hole as shown. Here the outside diameter is rough turned to 5.452 in. with a plus or minus tolerance of 0.005 in. and the piston ring grooves are also roughed out.

In rough cutting the grooves, an equal amount of stock is allowed on each side for finish grooving.

Next comes the water testing, as shown in Fig. 40. 160 lb. pressure is used in order to insure the casting being absolutely tight. The testing stand is very compact and enables the operator to handle the pistons easily and to apply the pressure in a convenient manner. It is, of course, necessary to hold the piston firmly in place and to fill the piston-pin holes with the plug as shown, in order to hold the high pressure applied.

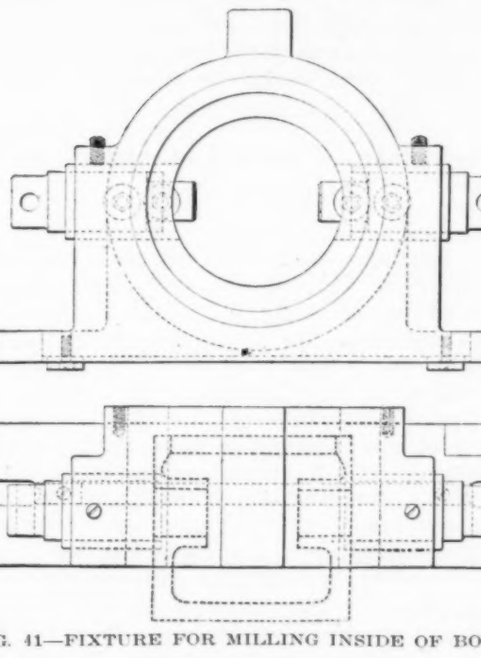


FIG. 41—FIXTURE FOR MILLING INSIDE OF BOSSES

The ends of the piston-pin bosses are finished on a hand milling-machine, using the fixture shown in Fig. 41. This fixture locates the piston by means of plugs which fit into the pin hole on each side and centers the bosses so that the finished faces will be square with the pin hole. An end mill 1¼ in. in diameter is used, stops being provided to control the movement of the table in each direction, so as to leave a space of 2 7/16 in. between the bosses, equally spaced each side of the center. The milling is done by a vertical movement of the table, carrying the bosses past the milling cutter which projects inside the piston.

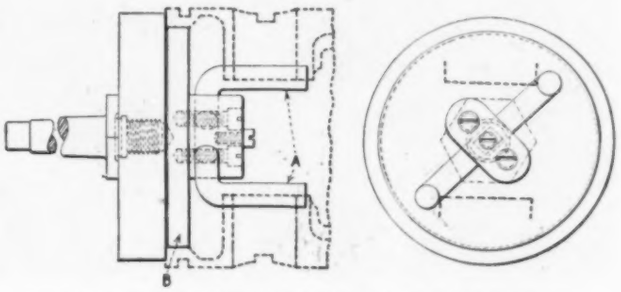
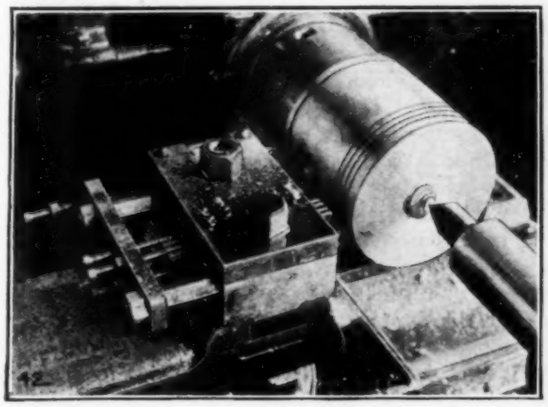
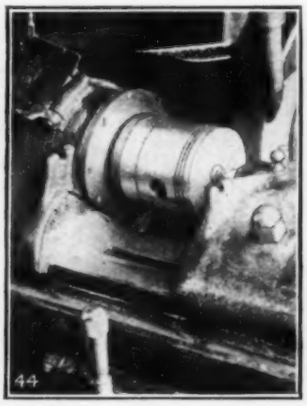


FIG. 43—DRIVER FOR GRINDING PISTONS





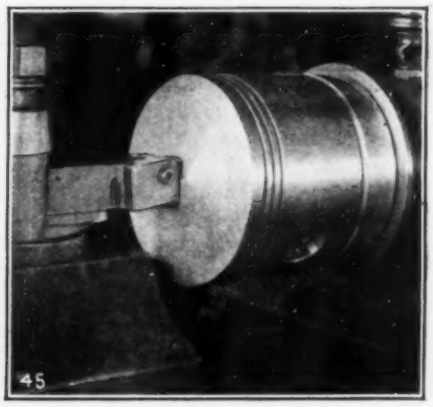


FIG. 42—FINISH GROOVING. FIG. 44—GRINDING THE PISTONS. FIG. 45—ROLLING FACE TO CLOSE PORES

The piston is next annealed by heating to 600 deg. F. and cooling in air, the same as is done with the cylinder-block casting. Then the open end is faced and finish bored on a Porter-Cable lathe, and the outer corner slightly rounded. The boss on the end is next faced off, the piston being held on a face-plate adapter, and a small center is drilled and countersunk in the usual manner. The head must not be concave more than ½ in. The piston is then finish grooved, using the tool block shown in Fig. 42, which also shows the convenient adjusting screws behind each sutting tool.

Rough and finish grinding are done on a Landis plain grinding machine, using the special adapter shown in Fig. 43 for driving the pistons. The construction of this adapter is clearly shown, and the outline of the piston shows how the prongs of the driver *A*, contact with the pin bosses while the piston is centered by the plate *B* fitting the inside of the skirt. The outer end of the piston is supported by a small center, as shown in Fig. 44. In both rough and finish grinding operations a wheel 14 in. in diameter by 2 in. face, and having a 5-in. hole is used. The wheel is of the crystolon vitrified type, grain 40 and grade J, the speed being from 5,500 to 6,000 ft. per min. The work speed may vary from 120 to 180 surface-ft. per min. A lubricant composed

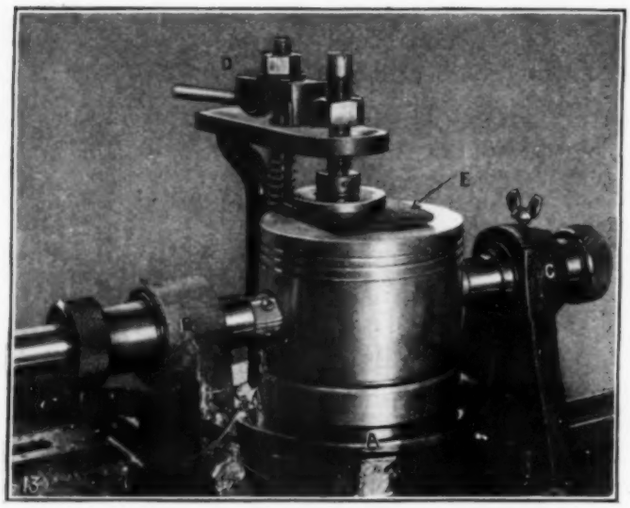


FIG. 46—FINISH BORING PISTON PIN HOLES

of half kerosene and half lard oil has been found very satisfactory. The tolerance for roundness is 0.002 in.

Another water test of 160 lb. pressure is given, and should any leakage develop, the top of the piston is rolled to compress the metal and so close the pores, as shown in Fig. 45. The piston is afterwards polished and retested to insure its being perfectly tight.

The piston-pin hole is rough and finish bored on a Willard engine lathe, using the fixture shown in Fig. 46, which is mounted directly on the carriage saddle. The hole is rough bored to 1.368 and finish bored to 1.378. A tolerance of plus or minus 0.001 in. is allowed in the rough boring, and plus or minus 0.0005 in. in the finish boring. In both operations the hole must be kept parallel with the axis within 0.003 in. in its own length.

As will be seen, the skirt of the piston is centered and held on the plate *A*, the position of the hole being located by suitable pins at each side of the fixture, the uprights for supporting them being shown at *B* and *C*. The piston is clamped in place by a somewhat unusual cam arrangement, as can be seen at *D*, a leather pad *E* being used to prevent marring the face by the clamping surface. It will also be noted that the actual clamping is done by a large disk, which distributes the pressure over a considerable area, and so greatly reduces the tendency of springing the piston head. The locating pins are removed and the two holes in the uprights *B* and *C* are used to guide the boring bars, and so insure the alignment of the two holes.

FIG. 47—WEIGHING AND STAMPING PISTONS

The piston is then cleaned, using kerosene and compressed air, after which it is weighed and the weight stamped on it, as shown in Fig. 47. The weights of the pistons are limited to between 4.25 and 4.50 lb. If it is necessary to lighten any pistons, it can be done by removing metal from certain points, but the weight must be kept between the limits mentioned. The pistons are also sorted into sets by weight. A thorough inspection follows, after which they are delivered to finished stock, being protected by wax paper before being placed in their containers.

Discouraging Absentees

BY FRANK V. FAULHABER

The habit of some employees of staying out, or "taking a day off," without notice can be the cause of a great deal of annoyance to the foreman, who is obliged to wait around until the middle of the forenoon to make sure that the man is not coming in, and then make a readjustment of his working force to compensate for the unexpected absence. One foreman of my acquaintance had a scheme of his own for combating such delinquencies.

Whenever a man who had previously been absent for a day and had excused his defection the next morning by saying that he was "sick," again failed to show up, the foreman would make it a point to visit that man's home at some time during the day to show his solicitude for the employee's physical welfare. Usually the good spouse would be surprised. "Why, no! she would exclaim, "John isn't sick. He went to work this morning as usual. Do you suppose anything could have happened to him?"

The foreman didn't "suppose" anything of the kind, and when the man came in the next morning no excuses or explanations were needed—or offered.

Egyptian Market for American Steel Products

America's share in the iron and steel trade of Egypt has been built up since the war to such an extent that a permanent position in this line is assured, says G. E. Phoebus, of the Iron and Steel Division of the Department of Commerce. The consumption of iron and steel products by Egypt has been steadily increasing. All such products must be imported.

The year 1922 witnessed an uphill struggle for British steel manufacturers in their efforts to maintain their influence with Egyptian purchasers, according to the British Commercial Agent for Egypt, who claims that competitors of the low currency countries held tremendous advantages. Belgium was the principal source of supply in 1922, far outstripping Germany which came next. The United States was third from a standpoint of quantity, shipments from the United Kingdom weighing considerably less although valued higher. The fact that the United States has been able to maintain its volume of trade in this market at a time when Continental nations held unusual price advantages, should be of great satisfaction to American steel exporters.

It Pays to Replace—

How a Shop Saved by Replacing Old Shop Equipment with New Equipment

By F. E. NORTH
Rate Department, General Electric Co., Schenectady, N. Y.

This article won the third prize of $50

THE wisdom of replacing old and obsolete machinery with modern equipment was amply illustrated in a shop where I worked several years ago. This shop installed a modern Gisholt boring and turning mill, having about 68-in. capacity. Within a short time this machine was taking care of all the work formerly done on two old machines, a boring mill and a pulley lathe, and about half of the work then done on an engine lathe, beside considerable other work.

The pulley lathe was operated by a mechanic who also had charge of another lathe, but it is safe to say that the operator of the Gisholt mill was doing the work of at least two men under the old arrangement and better and more accurate work at that.

Formerly it was a long and tedious task to bore a round and parallel hole on the old boring mill and it was an exceedingly difficult one to bore two or more holes alike. With the new machine duplicate parts were machined with quickness and ease. Where, for instance, in finishing a pulley it was necessary to bore it on one machine, and turn and face it on another, it was finished in one setting on the Gisholt.

There are many reasons why old machinery should be replaced by modern equipment, among them the following: The quickness, accuracy and ease of operation; the operator's ability to rapidly place cutting tools in any desired position; the convenient arrangement of both speed and feed changes; all with less physical exertion on the part of the operator.

Output of Small Tools Affected

The shops with old machine tools cannot get full value from the small tools, such as milling cutters and twist drills, that they buy, because their machines will not stand up under the high speeds and heavy cuts of which these small tools are capable. Modern tools permit the simultaneous use of two or more cutting tools. They also generally effect a saving in belting, and eliminate the time ordinarily lost on account of the slipping and relacing of belts.

The lubrication of modern machine tools does not depend so much on the care and thoughtfulness of the operator as in the case of the old machines. Lubrication on many machines today is automatic and continuous, eliminates the waste of delay occasioned by overheated bearings, and relieves the operator of the necessity of constant attention to oiling.

The floor space and power saved by modern machines are also considerable factors in their favor.

The shop which saved money by replacing old machine tools with modern was the E. D. Jones & Sons Co., Pittsfield, Mass., which has installed quite a number of machine tools since the time referred to, all of which have greatly increased production. The above statements can be verified by the superintendent.

Nothing stands still; if we do not go forward, we must go backward. This is just as true of the machine shop as of anything else.

This article won a $10 prize

By E. C. O'Dowd
Machinist, Hamilton Sons Car Co., Newark, Ohio

The Hamilton shops build and repair all kinds of rolling stock, with a forging department as a specialty. They were built in two rows, with a moving platform on six rails between them. All of the space between the shops had to be kept clean, of course.

Now the old platform has been taken out and replaced by a double-hook, 20-ton overhead electric crane, built by the Erie Steel Construction Co., of Erie, Pa., equipped with a Cutler-Hammer magnet. Everything that can be so handled is unloaded from the cars by means of the crane, and it is used for cleaning up the scrap in the yard. With the crane, two men can do the work that a dozen were formerly required to handle. It picks up a box car as though it were a toy. The main bay is now filled with iron and steel stock, which, although heavy, is easily unloaded, handled, and gotten at when wanted.

Another valuable change was the replacement of an old single-stage air compressor by a three-stage compressor, with condenser, built by the Bury Compressor Co., Erie, Pa., direct driven by an a.c. motor. The old compressor pumped about as much water as air, but the new one cuts out about all the water. This means a great deal in freezing weather, with air hammers.

All of the motors in the plant have been changed from d.c. to a.c., because the a.c. current, bought in this city, is cheaper than either a.c. or d.c. made with the old corliss engines. There is no rheostat, brush or commutator trouble. The motors were made by Robbins & Myers, General Electric, and Allis-Chalmers.

The toolroom and machine shop also have been changed. The old friction-clutch shaper has been replaced with a 24-in. Kelly crank shaper made in Xenia,

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In the contest, which closed July 5, nine prizes were given for articles telling how a shop saved by replacing old shop equipments with new equipment. Additional articles will be printed in forthcoming issues.

Ohio. It has a positive stroke, and an adjustable knee in front, which makes it more rigid. With this and a spiral bull wheel it increases the output of the machine to twice that of the old shaper. The eight speeds on the Kelly, to three on the old shaper, are also an advantage on hard stock such as chrome nickel, carbon, and vanadium steel.

We have two grinders to grind threading dies and reamers formerly ground on an old emery wheel. With the new grinder the threading dies and reamers cut more uniformly and do not have one or two teeth or flutes do all the work. These machines were built by the Modern Tool Co., Erie, Pennsylvania. We also have a grinder for grinding milling cutters built by the Woods Engineering Co., Alliance, Ohio. These cutters formerly were ground on a common emery wheel and not ground true. A few of the teeth did all the cutting. As ground on the new machines, they are uniform and each tooth cuts the same amount. There is no chatter such as we had before.

New Lathe Replaces Old

The old 18-in. lathe has been replaced with a new 18-in. machine, built by the Monarch Machine Tool Co., Sidney, Ohio. On the new lathe we have only one belt. With a threading dial no more is needed, but with the old lathe we had to have a reverse belt. In place of the wagon load of change gears around the lathe, all we have to do is to change three knobs and the machine is set up for the thread we want. In repairing, set-up time is the whole job, and the quicker the set-up the more time and money saved.

There are no more belts laced by hand. We use a Peerless belt lacer built by the Peerless Belt Lacing Machine Co., Philadelphia, Pa.

The old hack saw has been replaced by a Racine high-speed hack saw with compound pump. It will cut off a piece while the old one is getting started.

The old single-head bolt threader was replaced by a triple-head bolt threader built by the Acme Machinery Co., Cleveland, Ohio. Now one man runs three heads in the place of one, increasing production to three times what it was.

We formerly tapped nuts on the drill press. Now we have an Acme nut tapper, with six spindles run by one man. The old carbon drills have been discarded and high-speed drills have taken their places, with more than half again increase in production. We use Morse, Union, and National twist drills.

All the pipe that was threaded by hand is now threaded on a pipe threader built by the Williams Tool Corp., Erie, Pa. One man does more work than two men did before, and does it with less exertion.

The old man who used to file saws in the mill doesn't file them any more, but grinds them, two at a time, and then has time for other work. The circular saw grinder is made by the Machinery Co. of America, Big Rapids, Mich., and the band saws are ground on a machine made by Baldwin, Tuthill & Bolten, Grand Rapids, Mich. All the old man has to do is to get the machines set and then let them run until the saws are sharp.

We have about 175 air hammers and air motors of different makes but the latest thing is a hammer to drive spikes, built by the Dayton Pneumatic Tool Co., Dayton, Ohio. It is easier on the man and a man can do more work.

We have also in our plant six Carbo-Hydrogen outfits that save time and money. We cut carbon steel up to 8 in. square in about five minutes. It would be hard for us to do without these burning outfits. We use acetylene for welding. It saves on reclaiming broken parts on machines in the plant.

The new punch press that we have is equipped with a special head with three sizes of punches arranged for the selected size to drop into working position when a pin is pulled, saving the time of changing punches. This machine has a deep throat for wide stock. It is built by the Beatty Machine & Manufacturing Co., Hammond, Indiana.

In our forging department we have had small forging machines, but we now have a 3-in. Ajax machine, which does work that a blacksmith can't, and does it easily at that. Some work is completed in one operation, and other work requires two, three and even four operations. A day's run on a 3-in. Ajax would cover up a blacksmith for a week. This machine can make almost any forging.

All of the machines I have mentioned are new. I haven't said anything about the old equipment. Of course it is not as much out of date as some of the machines that were replaced. I think that a machine is like the dog, everyone having its day, and I think that if a man wants to make money he must buy late machines. I once worked on a planer, said to be 50 years old. It still ran, but it couldn't compete with the later types.

This article won a $10 prize

By Axel Halvorsen
McCormick Bros. Co., Albany, Indiana

IN LOOKING through the Shop Equipment News, of the *American Machinist*, some time last year, we saw the announcement of a new style telescoping tiering machine manufactured by the Economy Engineering Co., of Chicago. After investigation we purchased a machine of 750-lb. capacity. This machine has proved a great labor saver for us although we use it very little for tiering boxes and the like.

The telescoping feature of the machine enabled us to move it from one department to another and use it for moving heavy dies from die-storage rooms to punch presses. Likewise in changing bolster plates on the larger presses it eliminates the help of one or two men. In removing heavy flywheels from punch presses the tiering machine eliminates the necessity of rigging up a chain hoist and saves the work of two to three men.

Before getting the tiering machine a hinged platform on casters was used in making repairs on line shafts, installing pulleys, repairing or installing overhead wiring and other work. This platform, a makeshift at best, took up a great deal of floor space and was always in the way. Now the machine is run to the job and overhead repairs are quickly and safely made. In short, the tiering machine has done away with the clumsy platform and eliminated the dangers of working from a ladder.

In installing or removing electric motors, which in our plant are hung near the ceiling, the tiering machine can be used very economically. One man can, with this machine, accomplish as much as could three men working without it, on work of this sort. On the whole the tiering machine has proved a very good investment and we were glad to dispense with our old makeshifts.

Development of Machine Tools in New England

BY GUY HUBBARD

The third article—First steamboat on the Connecticut river antedated Fulton's "Clermont"—Morey's account of his experiments with steamboats—The gun-stock lathe

WHILE experimenting with his engine Captain Morey, who was at the time running a ferry between Orford and Fairlee, became convinced that it could be applied as a motive power for boats and he set about building a larger engine of the same type for this purpose. The larger engine was of the two-cylinder type, it being composed of two of the revolving engines, set at right angles to each other upon horizontal shafts at each side of an oblong, wood-fired boiler. This power plant was set up in a twenty-foot skiff having a paddle wheel mounted on a framework at the bow, so as to pull the boat along. At each end of the paddle-wheel shaft were rough sprockets fitted with ordinary log chains, and these sprockets were connected by chains to the valve disks of the double engine, upon which were mounted similar sprockets. This device furnished the transmission and served to link the power plant together, keeping the engines "on quadrature." In Fig. 13 is shown an outline of the boat and its power plant.

One Sunday morning in the Spring of 1793 (the time when the people were at "meeting" being chosen to avoid the jeers of a crowd in case of failure) Captain Morey launched his steamboat at his ferry landing at Orford and with one assistant to steer, while he himself managed the engine, they steamed up the Connecticut for several miles above Orford and safely returned, making about four miles an hour against a quite rapid current. This was fourteen years before the first trip of Fulton's "Clermont" upon the Hudson. Captain Morey was granted his first patent for his mode of applying a steam engine to a boat in 1795 and this patent, which bears the signature of President George Washington, is preserved at the New Hampshire Historical Society at Concord. See Fig. 14.

The successful operation by Captain Morey of his later and larger stern wheel steamboats, is cited by Bishop in his "History of American Manufacturers" as among the notable engineering events of the years 1794 and 1797 respectively and Prof. R. H. Thurston, in his "Life of Fulton," gives credence to the claims of Morey but by far the most complete account of these early steamboat experiments was written by Captain Morey himself in the form of a letter, which is preserved among the records of the New York Legislature. When, in the year 1818, Chancellor Robert R. Livingston petitioned the Legislature for a grant, in behalf of himself and Robert Fulton, to the exclusive right for the navigation by steamboats of the waters of that state, William A. Duer, one of the most influential members, presented the following letter from Morey and none of his statements were denied. The effect of Morey's work upon Fulton's later success I will leave to the judgment of the readers:

Orford, N. H.,
Oct. 31, 1818.

Wm. A. Duer, Esq.
Sir—

In answer to your inquiries relative to my experiments with steamboats, many years ago at New York, I will state the facts as briefly as possible.

As nearly as I can recollect, it was as early as 1790

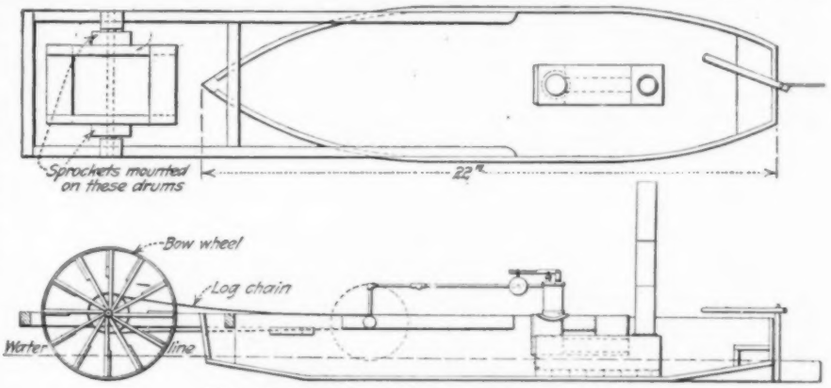


FIG. 13—MOREY'S STEAMBOAT OF 1793
(Drawn from contemporary descriptions)

that I turned my attention to improving the steam engine, and in applying it to the purpose of propelling boats. I began my experiments in this vicinity, on the Connecticut River. When my arrangements were sufficiently matured for exhibition, I went to New York and built a boat, and during three successive summers tried many experiments in modifying the engine and in propelling. Sickness in my family calling me home, I had the boat brought to Hartford, as a more convenient place, and there I ran her in the presence of many persons.

The next season, having made sundry improvement in the engine, I went again to New York, and applied the power to a wheel in the stern, by which the boat was impelled at the rate of about five miles an hour. I invited the attention of Chancellor Livingston, and he with Judge Livingston, Edward Livingston, Mr. Stevens (Col. John Stevens later a noted steamboat inventor) and others went with me in the boat from the ferry as far as Green-

For the author's forthcoming book. All rights reserved.

wich and back, and they expressed great satisfaction at her performance, and with the engine.

Chancellor Livingston requested me to continue my endeavors to devise a better mode of propelling, and I continued my experiments through the summer, encouraged by his promise, which was to give me a considerable sum, provided I succeeded in making the boat run eight miles an hour. He offered me at that time, for what I had done, seven thousand dollars for the patent rights on the North River and to Amboy; but I did not deem that sufficient and no bargain was made. I never received anything from him.

Being desirous of devising a more effectual mode of propelling, I continued my exertions, and, as it had been sickly in New York, I went to Bordentown, on the Delaware, in June, 1797, and there constructed a steamboat, and there devised the plan of propelling by means of two wheels, one on each side. The shaft ran across the boat, with a crank in the middle, worked from the beam of the engine with a shackle bar (commonly so-called); which mode is, in principle, the same as that now used in the large steamboats. I found that my wheels answered the purpose very well, and better than any other mode that I had tried, and the boat was openly exhibited in Philadelphia.

From that time I considered every obstacle removed, and no difficulty remaining or impediment existing in the construction of steamboats on a large scale, and I took out patents for my improvements. The notoriety of these successful experiments enabled me to make very advantageous arrangements with Dr. Allison (Burgess Allison, an influential man of that day) and others to carry steamboats into effectual operation; but a series of misfortunes to him and to others concerned, soon deprived them of the means of prosecuting this design, defeating their purpose, and disappointed my expectations, but I did not wholly relinquish the pursuit, from time to time devising improvements in the engine.

I recollect to have had repeated conversations with

FIG. 15—PORTRAIT OF THOMAS BLANCHARD
(From a wood cut made in 1839. From Howe's "Emminent Mechanics")

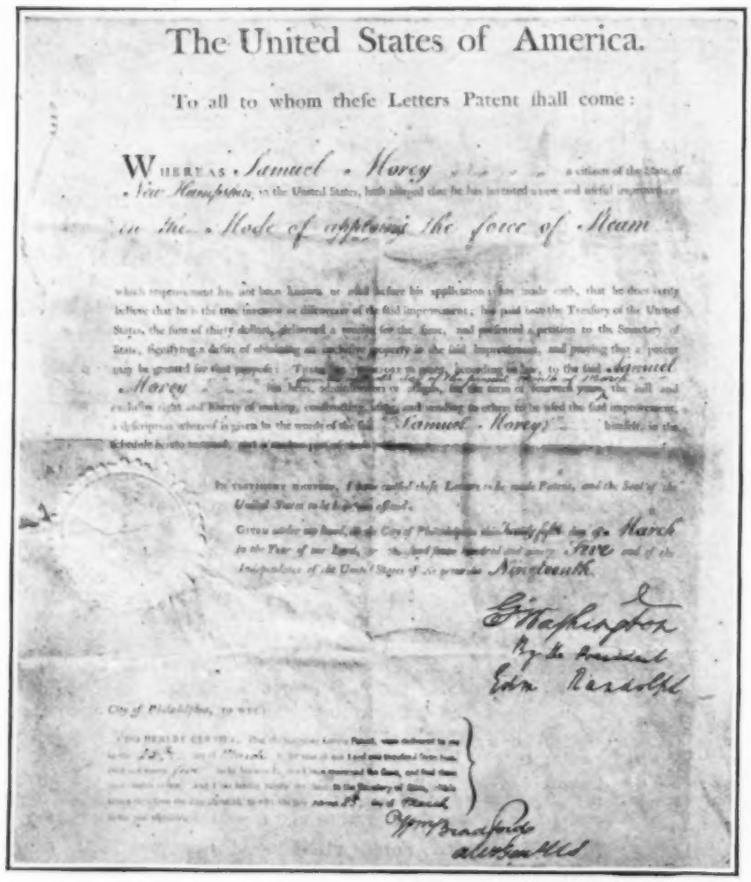
Chancellor Livingston and Fulton on the subject. The Chancellor once visited me at this place, and at his request and expense I went once to see him at Clermont.

I never had any doubt but that I had a right to take out a patent for the application of two wheels to a steamboat, and have often told Mr. Livingston and Mr. Fulton that I had. To the latter, I once asserted this right on board his steamboat with him; nor could I ever see the propriety or justice of Chancellor Livingston having an exclusive right to steamboats in the State of New York merely on account of the suspension of the efforts of Fitch & Company, when it was perfectly familiar to him that at much labor and expense, and the employment of years devoted to this pursuit, I had actually succeeded, so that nothing was wanted to carry this mode of navigation into effect but pecuniary means; especially when it is considered that I actually held patents relating to the subject at that time, and of which the Legislature of New York do not seem to have been informed.

I have often made passages in steamboats, and do not see in their construction any new principle; and it seems to me peculiarly hard that the originator of these improvements by which Messrs. Livingston and Fulton were enabled, principally, to succeed, should have had his rights overlooked, and himself excluded from the use of them on the very waters where many of his experiments were made.

I am, etc.,

SAMUEL MOREY.



The United States of America.

To all to whom these Letters Patent shall come:

WHEREAS Samuel Morey ... a citizen of the State of New Hampshire, in the United States, hath alleged that he has invented a new and useful improvement in the Mode of applying the force of Steam

... Samuel Morey ... Five ... March ... Washington ... Edm. Randolph

Courtesy of New Hampshire Historical Society

FIG. 14—MOREY ENGINE PATENT OF 1795

Samuel Morey was later associated with the firm of Rush & Muhlenburg of Philadelphia (James Rush and David Muhlenburg, sons-in-law of Oliver Evans and proprietors of his works) and in connection with them built some sort of an internal combustion engine. He obtained numerous patents besides those on the steamboat, one dated Jan. 19, 1819, covering a steam cannon. In 1820 he built another and larger steamboat on Fairlee Lake (now called Lake Morey in honor of the inventor). This boat, supposed to contain the original engine of 1793 was mysteriously

sunk in 1821, it is said by enemies, and to this day is somewhere in the mud at the bottom of the lake. During the latter part of his life, Captain Morey made his home at Fairlee, Vt., across the river from Orford, and he died there in 1843.

Steamboats which antedate Fulton's "Clermont" are known to be several and these as well as Morey's did much to inspire and to help Fulton. William Henry of Lancaster County, Pa., built and operated a steamboat in 1763 and Robert Fulton, as a boy, was well acquainted

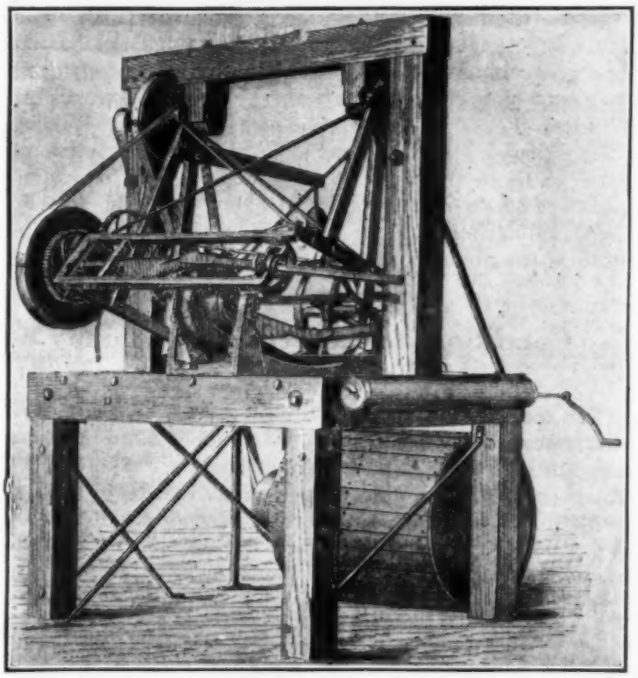


FIG. 16—BLANCHARD GUN-STOCK LATHE. BUILT ABOUT 1820 AND NOW IN THE MUSEUM OF SPRINGFIELD ARMORY
(From U. S. Census Report of 1880)

with him and his work. John Fitch, a friend of Henry's, built and operated a steamboat on the Delaware in 1786, which inspired Col. John Stevens of Hoboken to build his successful steamboats in 1802 and 1804. William Symington, an ingenious Scotch mechanic, built and successfully operated an iron steamboat on the Forth and Clyde Canal in 1788 and it is a well known fact that in May 1804, Robert Fulton was a passenger on Symington's third and highly developed steamboat, the "Charlotte Dundas," consulting with Symington and taking numerous notes and sketches of the mechanism and its operation. Robert Fulton, with the help of the wealthy and influential Chancellor Livingston, certainly was a great improver of steamboats and together they brought them into general use under the protection of a sweeping monopoly granted by the State of New York. Among the several inventors, upon whose work Robert Fulton's success was unquestinably founded, the "back woodsman" (Samuel Morey) certainly deserves a place of honor.

It is not strange that after having been the scene of the trials of some of the earliest steamboats, the Connecticut River should have been looked upon as a promising field for their use. The flatboats were fearfully slow, especially upstream, because the current was generally swift and the winding course and high banks of the upper river made the wind erratic and uncertain, so steamboats were early suggested as a remedy. Windsor, being by that time one of the largest towns upon the upper reaches of the river, became a center of steamboat movement and in 1924 the Connecticut River Co. was incorporated there for the purpose of further improving the channel of the Connecticut so that steamboats might navigate it. This company called into consultation no less personages than Governor Dewitt Clinton of Erie Canal fame and his chief engineer Holmes Hutchinson, both of whom recommended the complete canalization of the river by building dams with locks at suitable points to cover all rapids and shoals with back water. In 1827, Governor Clinton was received at Windsor with considerable ceremony and at that time examined and became interested in a pioneer Windsor invention to be described later on.

Canal too Costly

The elaborate canalization project of Governor Clinton and Holmes Hutchinson was too costly for the company to fully carry out and it remained for that picturesque inventor, Thomas Blanchard, to solve the problem in a different way and to initiate steamboat navigation to Windsor. Thomas Blanchard, whose portrait may be seen, in Fig. 15, was born at Sutton, Worcester County, Mass., June 24, 1788 and began his long inventive career as a boy of thirteen by constructing an apple-paring machine which made him a favorite at all the local "paring bees" and which is widely manufactured in almost its original form to this day. He earned a place as one of Henry Howe's eleven "Eminent American Mechanics" who had lived up to the year 1839, by his invention in 1820 of the Blanchard "Gun Stock" or "Copying Lathe," Fig. 16, now in universal use in rapidly duplicating gunstocks, shoe lasts, axe handles, other crooked and irregular objects, and even statuary, automatically. Blanchard seems to have had an eye for publicity and business ability far beyond most inventors and when numerous "pirates" attacked his patents on the "Copying Lathe," he not only beat them in suits, but went to Washington, and with the able help of Daniel Webster, succeeded in getting a third term on his patent. While seeking this

This ticket entitles the bearer to Twenty miles passage
on board the Boats of the
Connecticut River Valley Steam-boat Company.
Windsor, January 20, 1831

FIG. 17—TICKET FOR PASSAGE ON UPPER CONNECTICUT RIVER STEAMBOATS

second renewal he operated one of his lathes in the basement of the Capitol, turning out oaken busts of Clay, Calhoun and Webster. This had much to do with his success and Rufus Choate of Boston, who opposed him, said "Blanchard has 'turned the heads' of these Congressmen, so we need not wonder at his victory."

In 1826, when a company at Hartford was attempting to build a canal about the Enfield Falls, a rapid two miles long near Windsor, Conn., Blanchard, who was then engaged in improving the machinery at the Springfield Armory, determined to build a steamboat which would

stem these rapids. With this object in view he carefully figured the power required and conducted experiments by which he discovered that a wheel set far astern was the secret of success in swift water work. As a result of these researches, Blanchard in 1828 constructed the steamboat "Vermont," eighty feet long, fourteen feet wide and drawing but fifteen inches of water when fully loaded. This boat, provided with an improved two-cylinder horizontal engine built of wrought iron and developing one hundred and twenty horse power from very high pressure steam, ascended the Enfield Falls with ease. About this time the Connecticut River Valley Steamboat Co. was being organized at Windsor and to promote its project, Thomas Blanchard started northward with the "Vermont" in the Fall of 1829. What followed is quaintly described in the following extract taken from the *Vermont Republican and American Yeoman* of Windsor, under date of Oct. 17, 1829.

"The Steam-boat 'Vermont,' Captain Blanchard, arrived here on Monday evening last, and was most cordially welcomed to our waters, by our fellow citizens, as was demonstrated by the firing of cannon and the ringing of bells, on that evening and the following morning. As a further expression of the kindly feelings of the citizens of Windsor toward Capt. Thomas Blanchard and of their best wishes for the success of his patriotick enterprise, he was invited to a publick dinner. On Wednesday a party of between sixty and seventy ladies, gentlemen and young persons, made an excursion up and down the river in the 'Vermont' of some 35 or 40 miles; starting about 10 A. M. and returning to their respective homes before sun-set, without any accident, or encountering the least obstruction to steamboat navigation, and are highly gratified, we believe, with the opportunity afforded for so pleasant and healthful a recreation. We were before assured by those who had witnessed the movements of the 'Vermont,' and are confirmed in his assurance by our own observation during the above excursion, that this boat is well adapted to the river navigation. She stemmed the most rapid current between this and Sugar River bar, apparently, if we may so speak, without effort. It was the intention of Capt. Blanchard to have proceeded up the river as far as Haverhill or Wells River, this Fall; but it was found on examination, that the lock at Queechee Falls was too narrow to admit the boat, and he has therefore concluded to return to Hartford the first of the next week. We are informed that a regular line of steam-boats will commence running in the ensuing Spring, between Hartford, Ct. and Springfield, Ms. and that efforts will be made to extend it farther up the river. We trust the inhabitants of the Connecticut River Valley will feel the importance of rendering these enterprising individuals every assistance in their power. That the river will, at some future day, be the channel of extensive commerce between the interior, and the sea board, we believe *certain;* and that it might become as effectually so, with due efforts, in *two* as in *twenty* years to come, we have scarce less reason to doubt."

A fac-simile of a ticket for passage on the boats of the Connecticut River Steamboat Co., is shown in Fig. 17.

This optimistic prediction was not destined to fulfillment, for the reason that within the next few years, the advent of railroads (of which Blanchard was one of the earliest ardent advocates) made the further canalization of the upper Connecticut unprofitable. In its natural condition it was not suited to efficient navigation. After building and for a time operating six small steamboats, one of which, the "John Ledyard" in 1831, actually made the passage from Springfield, Mass. to Wells River, the Connecticut River Steamboat Co. went out of business in 1833. Thomas Blanchard applied his swiftwater steamboats with great success upon the Ohio River and his type of boat came into general use upon the western rivers. In later life he was a noted expert in patent cases and became wealthy from his work and from his inventions. He died at Boston on April 16, 1864.

From that time forward the navigation steadily degenerated from steamboats to flat boats, from flat boats to "Boxes" (log plank rafts carrying goods) and from rafts to "log drives." It has only been within the last ten years that these picturesque drives have been discontinued—one of the last and largest having contained 60,000,000 ft. of spruce logs, which came down from the Connecticut Lakes to Holyoke in 1912. The dams and canals originally built for navigation served as a great impetus to manufacturing by being converted to power purposes. Today these hydraulic works at Windsor Locks, Holyoke, Bellows Falls and Wilder, supply power directly to some of the largest pulp and paper mills in the world, and from their hydro-electric plants to other industries all over New England, so that the canalization was far from being wasted effort in spite of the abandonment of its original purpose.

Conditions in the German Machine Industry

The machine industry suffered severely in 1922 from the effects of Germany's economic disintegration, according to the annual report of the Verein Deutscher Maschinenbau-Anstalten, summarized in the Industrie- und Handels-Zeitung of June 8, and related in this country by *Commerce Reports*, published by the Department of Commerce.

The association estimates that the present production of the industry, in weight, is only half that of the pre-war period. Among the greatest difficulties that have hampered operation are the condition of Germany's currency and the resulting capital shortage, the eight-hour day, excessive over-time wages, labor disputes, unsatisfactory supply of materials, injudicious taxation, and the import restrictions of foreign countries.

These difficulties have forced many hitherto unorganized manufacturers to associate, and as a result the number of organizations in the industry rose at the end of 1922 to 143, comprising 1,150 concerns, with between 500,000 and 600,000 workmen, about 90 per cent of the producing power of the entire industry.

Supplies of raw and semi-manufactured materials apparently gave a great deal of trouble to the industry in the past year. Some factories were able to obtain but 30 per cent of the material needed, the shortage of bar iron and thin plates being particularly acute. Frequent changes in iron prices led to complete disorganization of quotations in the industry and necessitated a general agreement on uniform prices so far as practicable.

The domestic demand, upon which the industry largely relied, declined during the year, and manufacturers were forced to depend to an increased degree on export sales. The export supplements required by the Government embarrassed the industry considerably in its efforts to increase foreign sales and pressure has been exerted by the central association with some success to have them reduced. Manufacturers are generally adopting the practice of invoicing export sales in foreign currency. It is estimated that 80 per cent of the foreign sales of 1922 were made in this way.

Present-Day British Lathe Design

By HUBERT BENTLEY

The cause for the embodying of new features—Three types of headstock in use—Improvements in tailstock —Provisions for feed changes and reverse motions

DURING the period of slackness which has been spread over the machine-tool trade in Great Britain in the last two years, many firms have taken the opportunity of overhauling their existing machine-tool designs. In several cases previous models have been displaced by tools embodying the very latest features. Taking the case of lathes, the leading manufacturers have marketed productions embodying features proved advisable by experiences gained during the war and in the immediate post-war boom. Former models have been abandoned and the tools now being produced will probably represent the fashion for the next few years, so far as the general lathe design is concerned.

Considering the new sliding, surfacing and screw-cutting lathes lately constructed by some of the principal lathe-building firms in Great Britain, it cannot be stated that any very remarkable departures have been made, but rather, the designs appear to embody a series of minor improvements; these generally affecting lathes of 6, 8, 10 and 12-in. centers. The quality of finish and well-rounded appearance of the new models leaves little to be desired.

THE PERIOD of slackness in the machine tool trade during the past two years has resulted in an overhauling of existing machine tool designs with the result, that former models have been abandoned and newer types produced that will probably represent the fashion for the next few years.

The lathes lately constructed represent no remarkable departures from former types but they embody a series of minor improvements such as stronger beds, increased bearing surfaces for the carriages to provide for heavy duty, adaption of inward moving cabinets, improvements in headstocks and tailstocks, and new types of feed gear boxes which consist of gears giving reverse motion as well as feed changes.

The most striking features of the lathes are the increased range of utility and the handiness of operation.

Stronger beds with increased bearing surface for the carriage allow for the performance of still heavier duty. The embodiment of square guiding edges and the narrow guide principle, is now recognized practice and facilitates the easy movement of the carriage. The gap with its removable half gap piece still retains its hold on British lathe design and without doubt adds greatly to its utility. In the best practice cabinets have been adopted for some time to support the beds. The gradual movement inwards from the extreme ends of these supporting cabinets is interesting to note. In one case this applies to the cabinet at the headstock end only, bringing it well under the gap and where it is most required. In other designs, both cabinets are brought closer together, thereby reducing the span. Today, full advantage is taken of these cabinets for storing such parts as the change wheels.

Coming to the driving headstocks, in each of the lathes under review, there is a choice of three types of headstock which may be embodied. The cone-driven type, however, retains its popularity but there is also a demand for the friction clutch-driven headstock and the variable speed type, as well as for the all-geared headstock. Four speed cones of ample diameter and width, with one or two variously arranged gear reductions and giving a range of 8 to 12 spindle speeds, appear at the moment the most favored. The single-speed countershaft is adopted as standard practice. As in former lathes the substantial hollow steel spindle with the end thrust taken on ball thrust washers is retained in the present productions. Plain parallel bearings with ample provision in the way of lubrication are adopted for the spindle. The day of the ball-bearing headstock has evidently not yet arrived. The pleasing effect of the gear guards for the headstock and other parts of these lathes is a noticeable feature. In the friction clutch type head, a three-speed cone and double back gears is usual, giving nine spindle speeds. The spindle is driven by a lever-operated toggle friction clutch either direct from the cone or through the two sets of gears, which are moved on the back shaft by a lever, to get the desired ratio. By means of the clutch, the change from geared to direct drive may be made without stopping the lathe or it may be used to stop the spindle instead of shifting the belt on the countershaft. This is an invaluable feature on chuck work, as the chuck can be moved or "inched" around, by a touch on the clutch lever, to bring the screws into position. The features of the almost totally enclosed variable speed fast headstock, which receives its motion from fast and loose pulleys and transmits the same to the spindle by means of variable speed cones and two gear ratios are already well-known.

The all-geared single pulley type head can be supplied with sprocket wheel in place of the pulley when a motor drive is required. The drive is taken by a single

pulley running at a constant speed and connected and disconnected to its shaft by a friction clutch. As the action of disconnecting applies a brake, a minimum of time is lost waiting for the lathe to stop. A combination of hardened steel sliding gears and friction clutches operated by levers at the front of the headstock gives 12 to 16 spindle speeds. Careful provision is made for the lubrication of all necessary parts and in one well known make, ball bearings are fitted to the shafts throughout to minimize friction losses. Simplicity and foolproofness are significant points in these headstocks and many useful features have been introduced from automobile practice.

Special attention is now paid to the location of the driving headstock. In one well-known lathe, after the final tests have been carried out and adjustments made by the screws between the bed shears, solid pieces are fitted between the lugs on the head and the shears and then screwed fast in position. Should the headstock be removed at any time it is not necessary to disturb these pieces and the head goes back exactly in the same place. In another design, a non-adjustable alignment strip is fitted to prevent tinkering with the center alignment, which is the cause of the inaccuracy of much of the work machined on the lathe. The alignment strip is secured to the front edge of the bed.

Improvements in Tailstock

The tailstock with its "set-over" motion for slight tapers is retained. The advantages of the solid spindle and screw passing through the barrel appear to be generally appreciated for the lathes above 8 in. centers while for smaller sizes the smaller diameter screw working inside the spindle is preferred. Split barrels died some time ago and the bolt and pad method is now generally adopted for clamping the spindle. Improved arrangements for facilitating the correct alignment of the tailstock are also now available, so that binding the same to the bed automatically aligns the tailstock center with the fast headstock center.

The ordinary tool rest and swivel slide and the 4-tool turret are still in favor and little alteration has been made in this direction. The apron mechanisms are now very compact while possessing two substantial bearings for each shaft. Quick engagement of the respective feeds is made, in combination with a drop out worm gear and foolproof arrangements are fitted to avoid breakages. Every facility is provided for quickly assembling and dismantling these aprons and the gearing may be readily inspected when desired. Steel wheels are adopted practically throughout for the aprons and gearboxes. Dial screw thread indicators are fitted to facilitate the cutting of screw threads. The adjustment for wear on the saddle is by taper gibs while conveniently placed locking bolts allow the carriage to be made secure in any position. Provision is made in these lathes, for the addition of a taper turning attachment at the rear of the carriage, should the lathe be required for turning long tapers.

The new feed gear boxes embody the nests of gears for giving the changes of feed as well as the reversing motion. The reverse is such that it can be used when cutting odd pitches in which case the lead screw nut is not withdrawn at the end of the cut. The screw is reversed until the tool is back at the starting point and the screw again reversed, thus keeping the nut in the correct thread. Four changes are adopted and obtainable by a single lever movement. Provision can be made when desired for the addition of a fine feed gear box for machining work requiring fine feeds, and in this case an extra range of four feeds is then available. With the standard gear box, four feeds are obtained and four different threads may be cut in combination with the change wheels which are neatly enclosed by a handy cover. An index plate indicates the feeds as well as the change wheels required for standard pitches. A reduced number of change wheels cover all requirements in combination with the gear box.

Method of Cutting Coarse Pitch Screws

Provision is made for the cutting of coarse pitch screws by coupling up one of the headstock shafts with the leading screw so that while the ordinary gear box may be used to cut threads from 40 to 1 per in., with the coarse pitch mechanism in action, threads of 1 to 18 in. lead and more may be cut.

Where it is desired to use these lathes for manufacturing, a stop rod on the bed allows the sliding feed to be tripped, forming a dead stop after tripping. In a similar manner cross stops may be fitted on the surfacing slide. For safety, a slip coupling is fitted on the feed shaft and arranged to slip in the event of a run in or an abnormal cut, without breaking the feed gears.

Suds pump, piping and tray, along with the usual steady rest, faceplate, driverplate, change wheels and countershaft, the latter in some cases with ball bearing hangers and a brake arrangement, go to complete the equipment of these lathes, in which probably the most striking features are the increased range of utility and the handiness of operation.

Why the Expert?—Discussion

By J. Madden

I think that the author of the story under the title given above, page 165, Vol. 59 of *American Machinist*, has been the victim of bad luck. He says that he has come into contact with dozens of cases where companies have sent out untrained trouble-shooters, only recently out of college.

His story has the attraction of not being of the popular variety, where the youth of innocent appearance puts to shame the veteran mechanics in saving the situation, whatever it may be, by using knowledge and a brain trained to think instead of relying wholly upon past experience.

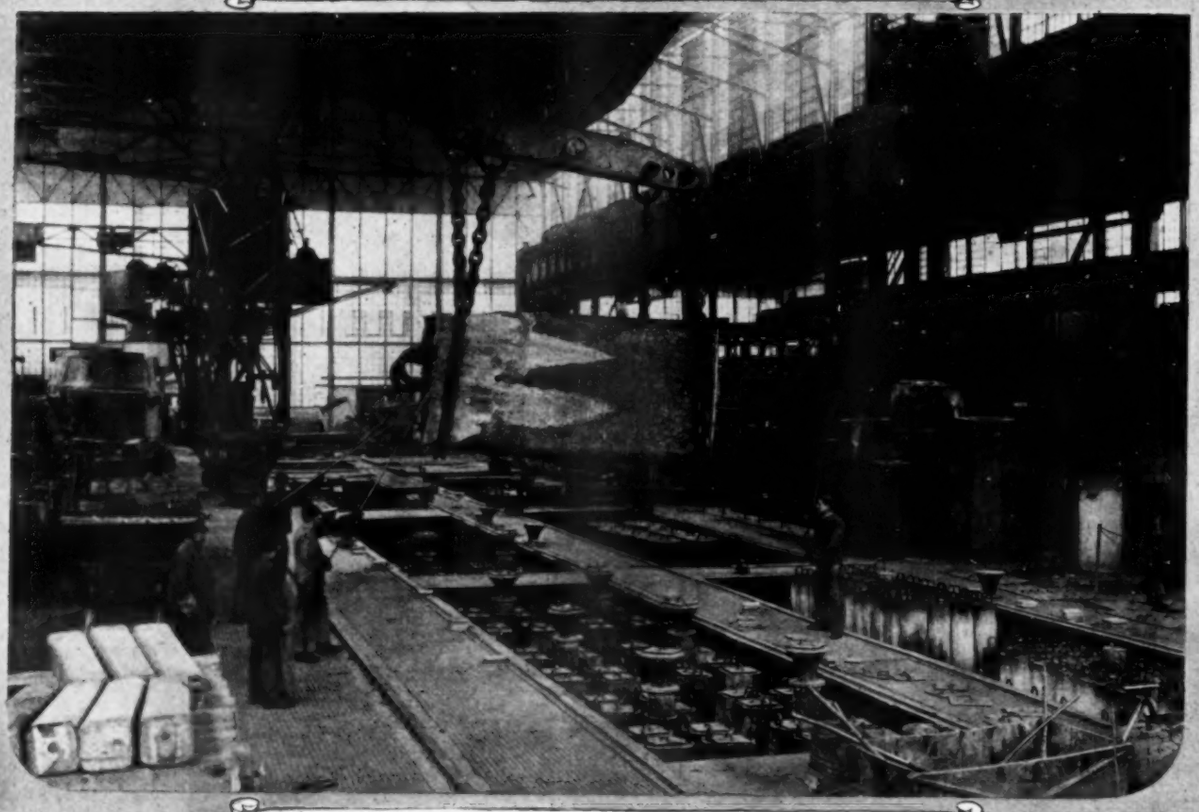
Nevertheless, there must be comparatively few companies willing to trust their trouble jobs, upon which in fact their reputation depends, to cubs just out of school. The system of shop schools for college graduates has long been in existence and is growing in favor. One of their strong points is that a man has to know what he is doing to get by. No one will discount the value of experience, but we must admit that the white-collar trouble shooter (generally a college man) has certain advantages that the "dyed-in-the-wool mechanic" does not possess.

There should be a happy medium, and there are signs that the day is not far distant when there will be available in every large manufacturing plant a group of men trained technically as well as by experience. Our schools and universities have recognized the need for them and they are now in production.

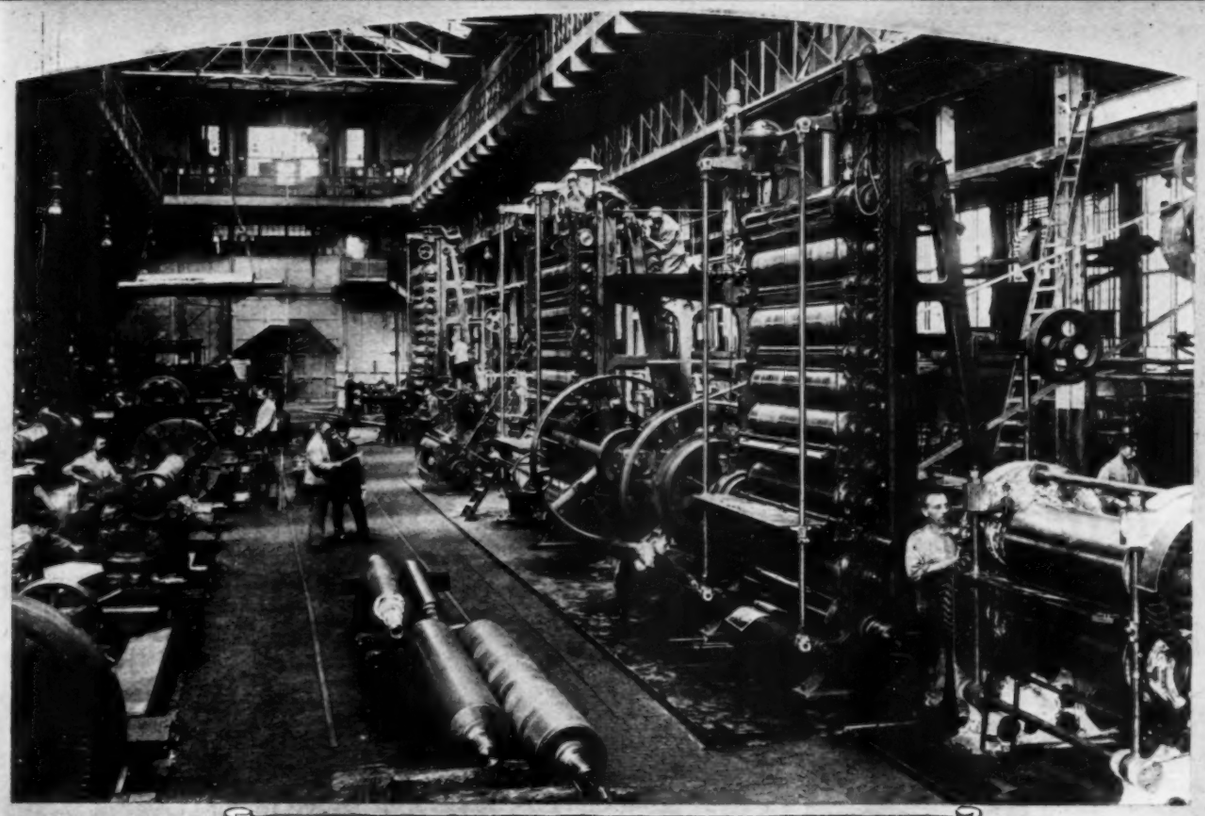
Where Machine Tools are Made

LODGE & SHIPLEY MACHINE TOOL CO.
ESTABLISHED 1893

The Foundry at the Krupp Works in Essen.
Note the handling equipment.

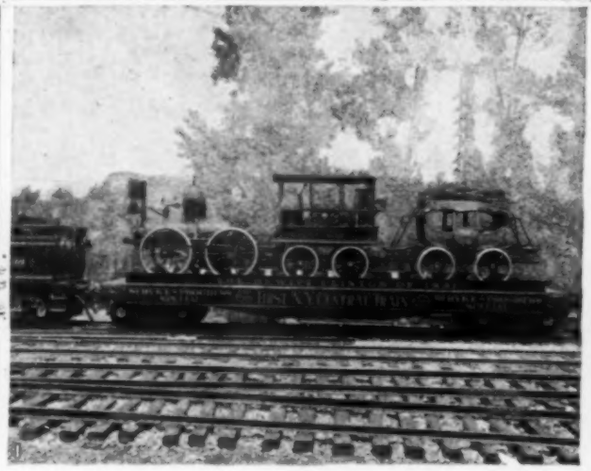


A big ingot suspended above the soaking pit in the Krupp Works



Erecting roll stands at Krupp's.
An indication of German Industrial Activity.

Hydraulic forging of heavy units in the Essen works of one of Germany's "trusts".



THE SERVICE ~ PROGRESS SPECIAL

An Educational Train *of the* New York Central which recently toured New York State

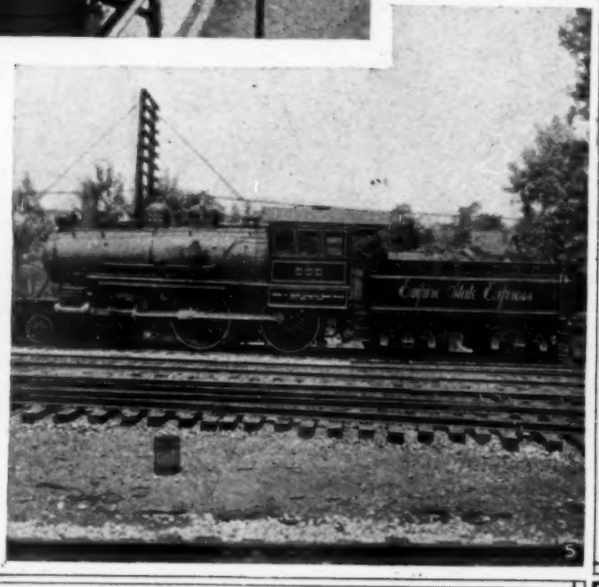
1 The DeWitt Clinton the New York Central's first train

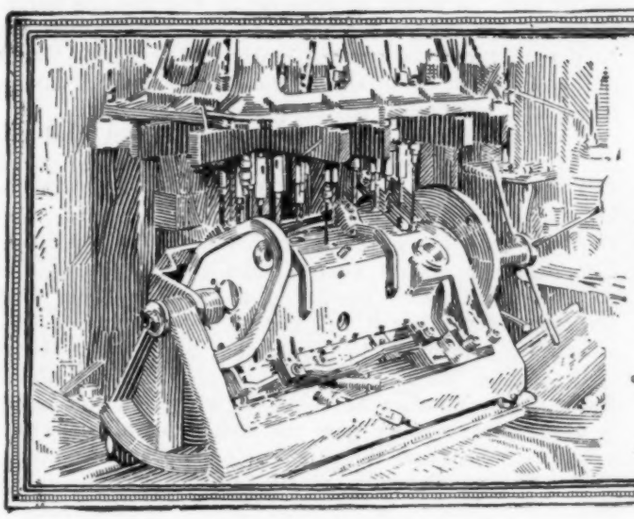
2 An exhibit picturing the railroads' place in tax statistics

3 A car devoted to pictures and models showing the evolution of the locomotive from 1803 to date

4 The complete train pulled by a "Mikado" freight locomotive of remarkable power

5 Engine 999 of the Empire State Express, holder of the world's locomotive speed record of 112½ miles per hour





Tool Engineering

By
Albert A. Dowd and Frank W. Curtis
President and Chief Engineer
Dowd Engineering Company, New York City

Design of inspection gages continued—Treatment of some difficult problems—Concentricity gages—Value of indicating gages—Applying the principles

IT IS obvious that all of the gaging problems which may come up from time to time in general engineering work cannot be taken up and discussed separately, as space would not permit. However, it is our aim to show as many examples which require a different kind of treatment as we are able to do. Each problem which the tool engineer encounters must be treated as a separate matter and gages made to suit the condition. A careful analysis of the problem will often show points of similarity between one piece of work and another which has previously been gaged. The same methods which have successfully been used in one case can often be applied in another of a similar kind.

We have pointed out a few of the most common cases which require indicating and inspection gages or fixtures, but the example shown in Fig. 554 is radically different from anything previously dealt with. The work *A* is a bronze casting of a peculiar shape and one which required considerable ingenuity in the design of production tools. The entire casting is about 6 in. high and the two bosses *B* and *C* are carried on a thin web *D*. Both sides of these bosses are machined and the slot *E* is eccentric to the hole *F*, as shown at *G*. This eccentricity is important and must be gaged carefully, as the tolerances are very small. The distance *H* from the center of the hole *F* to the center of the hole *K* is also important, and the distance *L* must be held within a tolerance of 0.001 in. It can be seen that the most difficult part of this gaging problem consists in determining the eccentricity of the slot *E* with the hole *F*, and a principle was used for this purpose entirely different from anything which has previously been mentioned.

The type of testing fixture used for this work is shown in Fig. 555. The base of the fixture *A* is of cast iron, and it has a pocket at *B* in which the work *C* is seated. The flange portion *D*, however, rests on the finished boss surrounding the pocket. The center location of the work is made on the plug *E*. When the piece is set in position the operator pushes forward the clamp *F*, which rests on the top of the boss *G*. As he tightens the thumbscrew *H*, sufficient pressure is brought to bear to hold the work firmly. By referring to the previous illustration, it will be noted that the slot between the bosses on the work is eccentric to the hole. Therefore, some means of straightening out the slot when setting it up must be found in order to make sure that it is located correctly.

The operator, therefore, tightens the screw *H* only enough to make certain of location, but not enough to prevent the piece from turning. The shaft *K* passes through the two bushings *L* and *M*, and the end is squared up at *N* so that it is a trifle larger across the corners than the slot in which it enters. The position of the squared-up member is clearly shown by the small

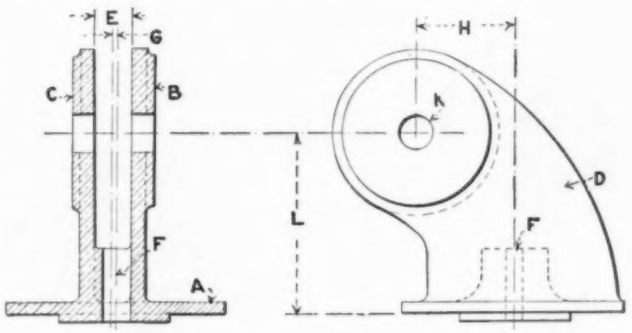


FIG. 554—EXAMPLE OF A DIFFICULT GAGING PROBLEM

diagram at *O*. When the operator turns the knurled knob *P*, this action causes the squared end of the shaft to revolve and thus straightens out the slot and brings it into its correct position. After this the thumbscrew *H* on the clamp can be tightened to make it secure.

It must be remembered that the eccentricity of the slot to the hole has been previously determined and that the only function of this squared-up shaft is to straighten it out in the fixture and get it in the correct position. It might be possible to locate it in the fixture on a central plug and also on a locating block of the same size as the slot, but in all probability there would be considerable difficulty in getting the work in and out of the fixture, as the parts would need to fit each other very accurately.

The work has now been located properly in the testing fixture, and we are to determine the accuracy of the central hole with the points indicated in Fig. 554. To obtain the correct height and alignment of the hole

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we pass through it an accurately ground bar *Q*. This bar is made long in order to multiply any errors in alignment. On each side of the fixture there are brackets *R* and *S*, and in them a shaft *T* is fixed. An indicator *U* is mounted on a casting *V*, which has a small counterbalance *W* at the other end. The casting *V* is a sliding fit on the shaft *T*, and the operator moves it along toward the ends of the bar *Q* in making the test. The indicator has previously been set to zero by means of a "master," so that any variations in the alignment and in the vertical position of the bar *Q* are very easily determined by a glance at the indicator.

The twist of the shaft *Q* is determined in a similar manner by an indicator *X* mounted on a counterbalanced casting *Y*. This casting is a sliding fit on the bar *Z* so that it can be moved backward and forward in making the test. This indicator also must be set to zero by means of a master before attempting to gage the work. The small counterbalances placed opposite the two indicators are so proportioned that they will keep the indicators raised and out of the way when locating the work in the fixture or removing it.

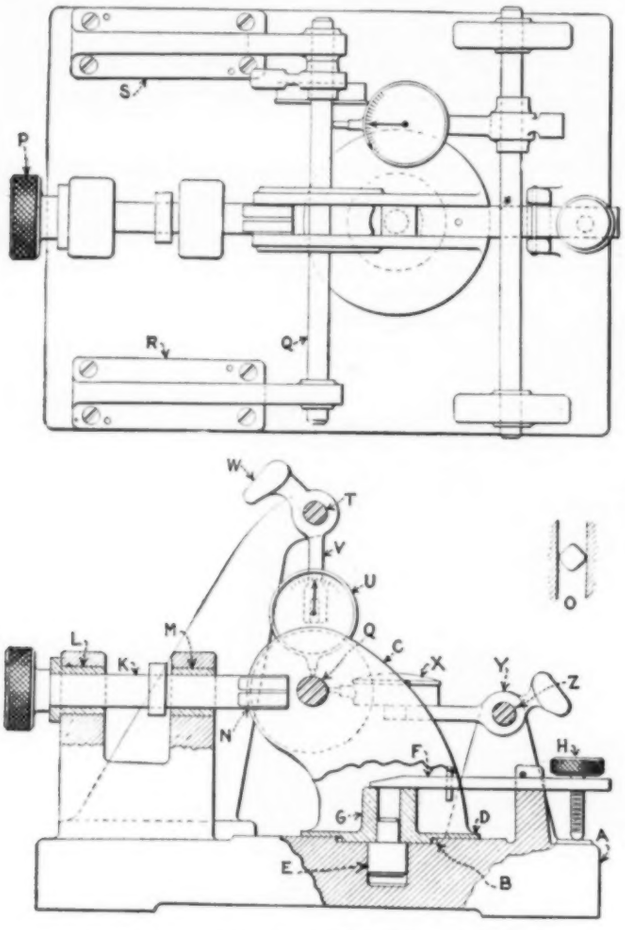

FIG. 555—TESTING FIXTURE FOR DIFFICULT PIECE OF WORK

There are other methods which can be used to test this piece of work by using movable gages of the go and no-go variety in somewhat similar fashion to those shown on the cam testing fixture in the previous article. These gages would be all right for determining the height of the bar *Q*. Other means, however, would be necessary to determine whether there were any twists in the bar. It might be possible to find out the variations in this regard by using feelers between certain fixed points and the bar. A method of this kind would probably be somewhat slower than that shown, although it would undoubtedly be cheaper.

When making an indicating gage a great deal depends upon the number of pieces which are to be gaged and the accuracy required. The type of gage shown here is somewhat expensive and might not be warranted when only a few pieces were to be machined. The designer should always take these matters into consideration before designing a gage, in order that the costs of making it will not be excessive when considered in proportion to the number of pieces tested.

In gaging the concentricity of cylindrical surfaces there are a number of methods which can be used. A great deal depends upon the number of pieces which are to be gaged and the shop equipment which is available. The construction of the piece and the various points of importance are also factors in determining the method of gaging. For example, we may consider a simple piece of work having a hole in the center and a flange or rim 4 or 5 in. in diameter, and it may be necessary to test the running of the outside diameter with the hole. If a simple problem like this is encountered it is a very easy matter to force the piece on an arbor and hold the arbor on centers in a lathe, using a dial indicator to make sure that it runs truly.

If another piece of work is considered that has no centers which can be easily used for testing purposes, some method must be provided by means of which the work can be held and revolved while testing. It does not always follow that because an inside and an outside surface are machined at the same time, they will be perfectly concentric; but occasionally work which is held so that both operations are done at the same time can be tested by means of an indicator while in the machine, in order to make sure of the concentricity. It is generally the case, however, that the final inspection demands another test before it is certain that no errors in machining have been made.

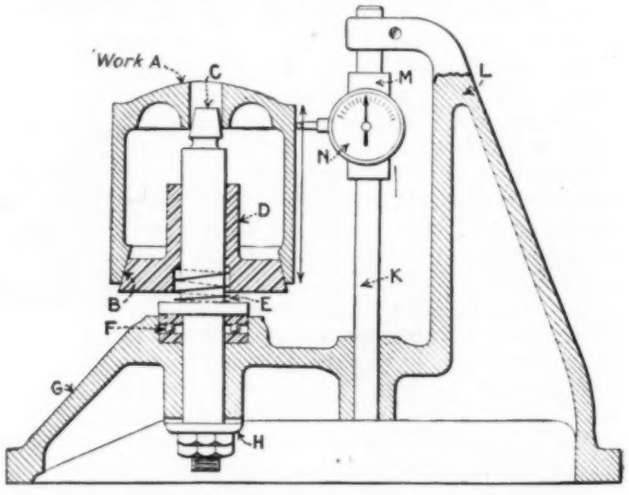

FIG. 556—CONCENTRICITY INDICATING GAGE

Flywheels, clutches, pulleys, gears and other running parts often require a test for concentricity, but many of these parts do not necessitate any great amount of special equipment. When an extraordinary case is found which cannot be tested by any of the methods mentioned, a special testing device must be made to suit

the particular condition encountered. An example which illustrates principles that may be found useful for work of this kind is shown in Fig. 556. The work *A* is a casting which has been machined all over the outside surfaces, in the small hole at the top and in the angular portion *B*. The requirements of the work are that the outside shall be concentric with the tapered portion and the end hole. It might be possible to set up this piece of work on a spindle having a conical surface, use a center in the end hole and test the piece on an engine lathe. The production, however, being large, would require the continued "tying up" of an engine lathe for this purpose, which is hardly warranted. A testing fixture therefore seems advisable.

The base of the fixture *G* is of cast iron and contains a center plug which rests on a ball thrust bearing *F*. The shaft is held in place by a collar and nuts at *H*, and so fitted that it is free to revolve. The upper end of this plug is pointed at *C* so that it enters the end hole in the casting. The conical sleeve *D* is a sliding fit on the plug, and is held up by a coil spring *E* which barely overcomes the weight of the sleeve. When the piece *A* is placed in position ready for testing, the pointed portion of the plug *C* enters the upper hole and the conical bushing *D* makes contact in the tapered portion, but does not lift the casting away from its seat on the end of the plug.

The shaft *K* is vertically mounted and held in the base casting in some suitable manner. The upper portion *L* may be a part of the base casting or a separate extension from it, according to the designer's fancy. A special clamp *M* is used to hold the indicator *N*, and the clamp is so made that it is a sliding fit on the rod *K*. In testing the work the indicator is moved up and down by the operator while the work *A* is being revolved, and in this manner any variations in the concentricity can be readily detected by fluctuations in the indicator point.

Labor Problems of the British Machine Builder

By Albert Clegg

SO FAR as Great Britain is concerned it is not strictly correct to refer to the present state of almost hopeless stagnation as fluctuation, since, apart from the all-too-brief boom which succeeded the armistice, conditions have gone from bad to worse with little apparent prospect of any immediate improvement. It is extremely doubtful if the British machine tool industry is working at anything like one-third capacity, for there are quite a few firms who are practically shut down, while a majority of the remainder are carrying on under an almost insupportable load of financial difficulty which is every day becoming more and more acute.

America, on the other hand, seems to have recovered with surprising rapidity, but even she does not appear to be yet able to absorb the maximum production of her own machine tool makers, though most other trades appear to be experiencing more or less of a boom. So far as general engineering is concerned, America is right up against a problem which has been agitating some of our British employers for some time, and that is the decreasing supply of skilled men. But whereas you are feeling the shortage already, it is with us more a question as to what will happen when trade recovers.

The men having been so long on short time or idle, it is not to be wondered that they are leaving the business whenever an opportunity arises. All kinds of one-man businesses are being taken up in the effort to make ends meet. There are practically no lads being apprenticed to the trade to make good the normal losses in man-power, so that the outlook for the future, when the long-looked-for trade revival comes along, is the reverse of promising. Speaking from memory, I believe the standard rate of pay for skilled engineers is 54 shillings a week, short of $14, and even this low rate cannot attract sufficient business to keep half the skilled men in the country fully employed. Can one blame the men for getting into other trades, or can one blame parents for refraining from putting their lads to such a poorly paid job? Street-car conductors, road-sweepers, and many other classes of unskilled labor, can all earn bigger pay, and one cannot, therefore, logically expect anything else but a labor shortage. It is almost inevitable.

Some time ago, I was informed by a British machine tool maker that he had been very much surprised at the number of his men who had gone into other businesses and other jobs outside the engineering trade. His trade had taken a turn for the better, after having been almost non-existent for many months, and he had written some of his old employees asking them to start work again. The response rather staggered him since only one man out of every four wished to resume. The rest had either started business on their own account or had found some other more remunerative job than machine tool making promised to be. This man's works are even now only running at something under half capacity, and yet he feels the effects of a shortage. What would be the position if every machine tool firm in the country were fully employed. There would be a very acute shortage which would continue until the remuneration became sufficiently attractive to encourage a fresh supply of apprentices, and until these apprentices had served the necessary length of time, four or five years, at least.

We can, therefore, make up our minds to accept the inevitable. For at least four years after trade recovers the shortage of skilled men will become more and more pronounced, because, while, during this period there will continue to be the normal shrinkage due to death, retirement, and so on, there cannot, in the ordinary course of events, be any fresh influx of skilled labor until the end of that time, and even then, the supply will only be a comparatively raw contingent, with most of its wisdom teeth still uncut. It seems to me that for the next ten years at least, the supply of skilled engineers will be somewhat restricted, the consequence of which will be that machine tool prices, wages, and the values of other incidentals intimately associated with skilled engineering labor, will rise. All sections of the industry, individually and collectively, will then stand a possible chance of getting a little of their own back.

For those who can last out, there is a good time coming. The pendulum of trade will swing back and the survivors, both employer and employed, will reap the benefit of the operation of the economic law of supply and demand.

Welding High-Speed Tool Steel to Ordinary Shanks

By W. J. Seibert
Erie Works, General Electric Co.

From the *Journal* of the American Welding Society

During the past few years there has been a great deal of discussion as to the production and conservation of small tool equipment, yet few concerns realize the saving which can be effected by the use of resistance welding, especially in the production of tools for lathes, planers and shapers.

We are at present using about 200 lb. of steel tools per week; under normal conditions we will probably be making up twice this quantity. Formerly the entire tool was made of high-speed steel, but at present, with the use of butt welders, nearly all of the tools are made by welding a section of high-speed steel to a carbon shank which reduces the cost considerably. We have three Thompson welders at present, used in welding several hundred types and shapes of tools.

The tool section to be welded is generally ground straight on the end, and the high-speed section which is to be welded on this shank is cut to the proper angle to give the necessary rake to the tool. We have several types of jaws which were made up for holding the various shapes, each operator having personal ideas as to the method of operation and, as a rule, devising his own type of jaw.

In welding the tools it is necessary to have both the high-speed section and the shank fairly free from scale, inasmuch as it is essential to have good contact between the copper jaws and the work. The selection of the proper heat is generally a matter of experience with each particular type of steel. After selecting the proper heat, the two sections are brought together under firm pressure and allowed to heat to a point of incandescence. If the shank and high-speed section do not come up to a uniform temperature, the current is shut off for a few seconds, allowing both portions to reach the same degree by transfer of heat from the hotter piece. The current is again applied, and when sufficiently heated, the work is forced together under very strong pressure. This is a modification of the flash-weld method in which the pieces to be welded are brought together very lightly, establishing an arc which heats the ends to the welding point in a very short time. Pressure is then applied, forcing the pieces together and forming a good weld.

Scale Is Forced Out

Due to the fact that the metal is in practically a molten state, parts of both the shank and high-speed section are forced out and form a fin. This action allows the molecular structure of the two sections to come in intimate contact and any oxide or scale which might have been entrapped between the two sections is forced out, leaving perfectly clean metal in contact. We have found that this method is preferable to the older method of heating the sections to a white heat and then squeezing them together under high pressure, as this latter method frequently developed flaws in the welding.

For the tool of average size, that is, a shank about ⅜x1½ in. section, we allow a ⅝-in. projection between the jaws for the high-speed section, and allow 75 per cent of the distance for the carbon; this distance, of course, is varied for larger tools, allowing greater projection. It requires approximately 2½ min. to clamp the two sections in the machine, weld and then place in the annealing furnace.

The heat treatment to which these tools are subjected is of vital importance, it being necessary to place them in a muffle-type furnace immediately on removing from the machine, and before they cool to any appreciable extent. This furnace is run at a temperature of 825 deg. C. for about two hours after the last tool has been placed in the furnace, and then the heat is shut off and the furnace is allowed to cool overnight. In a well-insulated furnace, the tools will be at a temperature of about 200 deg. C. in the morning, and can be removed at that temperature. The tools are snagged or rough ground, heated to 875 deg. C. and quenched in No. 2 Houghton oil, and then ground and hardened by the usual high-speed method. The method we are using is to heat the tool to 1,300 deg. C., then quenching in molten lead at 600 deg. C.

Many Uses of Resistance Welder

The resistance welder can be adapted for use in welding drills, taps, small armature shafts and in fact any section which can be handled in the jaws. We are saving considerable money by welding extra-length shanks on drills and taps.

We have, for the past four years, been welding bandsaws for use in the pattern shop on wood-working machines, and also the bandsaws adapted for sawing metals. It can readily be realized that considerable money can be saved by welding the saws instead of brazing them, as in brazing it is necessary to scarf the saw for a considerable distance. The saw is ground off square at the ends, then placed in the jaws of the welder with approximately ⅜-in. projection from each jaw. The ends are brought up to temperature and forced together under sufficient pressure to squeeze considerable metal from the weld. Before the saw is removed from the welder the jaws are moved back about ¼ in., then light heat is applied two or three times for about two seconds each time, thus annealing the weld and removing any strains which might cause fracture. The saw is then ground to a uniform thickness on an ordinary grinder. It is unusual to have the saws returned broken at the weld.

Tool Costs Reduced

The cost of current used in welding is really the smallest item, as a ⅜x1½-in. tool can be welded with a current consumption of approximately 0.3 kw.-hr., the cost of which, when compared with the cost of the steel, is really insignificant. Odd-shaped tools can be produced very readily, it being necessary only to make jaws adapted to the shape, the expense of which, when compared to the cost of forging a tool, leaves a balance greatly in favor of the welding method.

Any factory using more than 50 lb. of tools per week can use a welder to good advantage, to say nothing of the production work to which it might be adaptable.

A careful check has been kept on the cost of welding these tools, and this past year we have had a net saving of 70c. per lb., after figuring in the extra cost of snagging, heat treating, etc., which when figured on a 50-lb.-per-week basis means a saving of $1,820 per year. From these figures it can readily be seen that the resistance welder is not only a great convenience, but also a real money-making proposition.

Automotive Service Methods and Equipment

By HOWARD CAMPBELL
Western Editor, *American Machinist*

Conclusion of eighteenth article — More Cadillac service station tools—Indexing feature for grinding reamers—Tire-removing press — How generators are tested — Other tools

THE TOOL shown in Fig. 13 is an index head used for grinding Martell reamers. On the back of the head a shank is turned with a taper corresponding to the taper in the spindle of the grinding machine into which it fits. The head is made with 24 notches so that practically any division required can be obtained. The tail of the dog which drives the reamer consists of a short section of bar steel, the end of which is held between setscrews through two lugs on the grinding head as shown. When the reamer is

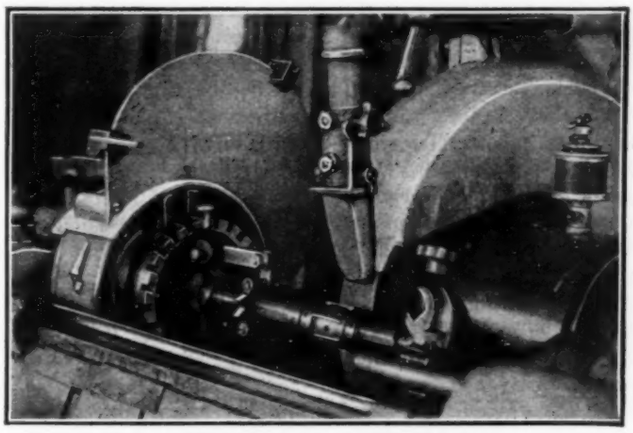

FIG. 13—GRINDING A MARTELL REAMER

clamped in position for grinding, these setscrews are not released until all the blades have been ground. Then the screws are adjusted to turn the reamer around far enough so that a 6-deg. clearance can be ground on the back of each blade. These screws make it possible to grind any amount of clearance or any degree of backoff on the reamer blades, and equal divisions are obtained without any difficulty.

A machine for punching rivet holes in Raybestos bands and also for heading the rivets is shown in Fig. 14. This machine eliminates the possibility of distorting the brake bands by hammering, as the job is usually done, and saves approximately 1¼ hr. labor on each set of brake drums that are refitted with Raybestos. When a hammer is used, the brake band always has to be straightened afterward, with the result that the original symmetry of the band is never obtained, and the job looks as bad as it is. The heading die is made so that the heads of the rivets will be cupped, thus preventing any wear from coming on the rivets until the lining is nearly worn off.

The piece shown at *A*, Fig. 15, is a spring bushing and the rest of the paraphernalia with which it is connected is a tool for removing worn spring bushings and installing new ones in their places. To remove a bushing from a spring, the long screw which extends through the center of the tool is put through the bushing from the outside and then the small nut *C* is screwed on at the inner end of the bushing. The piece *B*, which is hollow to receive the bushing, is braced against the spring over the outer end of the bushing and the screw is drawn through the hole by turning the nut *D*, the screw bringing the bushing with it as it comes. A wrench can be applied to the square head on the right-hand end of the screw so as to keep the screw from turning when the nut is turned.

When assembling a new bushing to the spring, the screw is inserted through the hole from the outside, the bushing is put on over the screw and then the nut *C* is screwed onto the end of the screw and power is applied as before.

After the bushing has been pulled into place, it must be reamed to size, which is done with the reamer shown lying on the bench. The reamer is ¾ in. in diameter with eight blades on a left-hand spiral. A pilot on the end of the reamer centers the tool and makes it easy

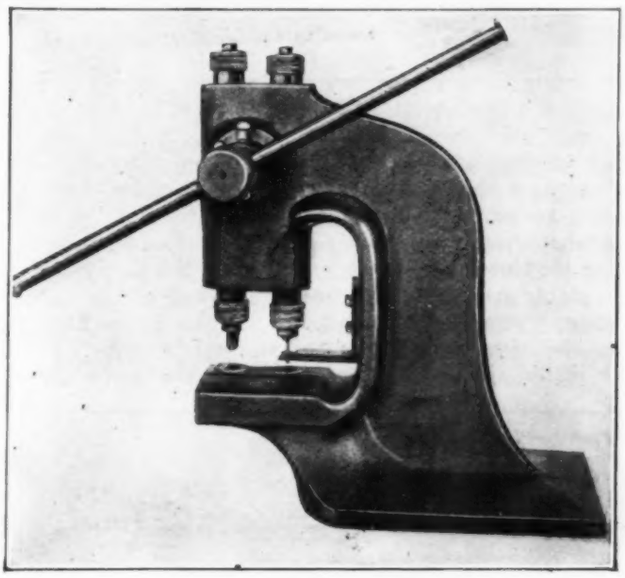

FIG. 14—BRAKE BAND PUNCHING AND RIVETING MACHINE

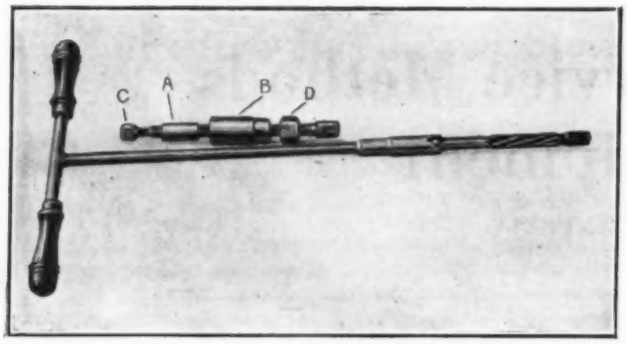

FIG. 15—SPRING BUSHING ASSEMBLING TOOL AND REAMER

to start the reamer through the hole. The reamer handle is long enough so that it extends out beyond the fenders and wheel and thus can be easily operated. The reamer is driven by means of a pin through the shank, the pin extending on both sides of the shank far enough so that the ends engage in the two slots of a ratchet in the end of the reamer handle.

Those who are familiar with the multiple disk clutch

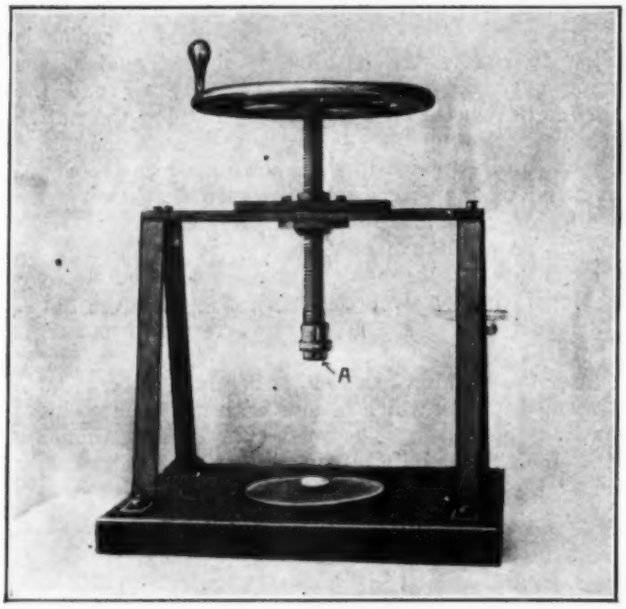

FIG. 16—CLUTCH ASSEMBLY TOOL

used in the Cadillac car will understand the operation of the tool shown in Fig. 16, although there was no clutch available for demonstration purposes at the time the photograph was taken. This is a tool for assembling the clutch, and is designed to hold the spring while the plates are being assembled. The hub of the clutch spring is placed over the pilot in the base of the fixture, and also over the pilot on the end of the screw, after the plates are in position. Turning the screw down

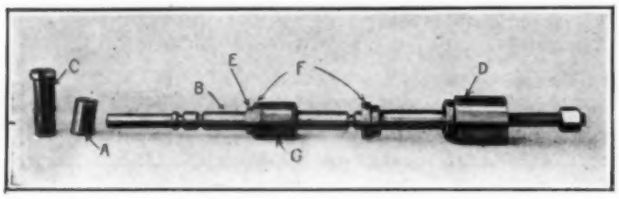

FIG. 17—TOOL FOR REPLACING CAMSHAFT BUSHINGS

compresses the spring and holds it while the plates are being bolted together.

A tool for installing and removing camshaft bushings in crankcases is shown in Fig. 17. To assemble a rear camshaft bushing *A* in place, the shaft *B* is put through the camshaft bearing holes, then the split bushing *C* it put into the camshaft bushing and expanded so that it can be slipped over the small end of the shaft, where it is held in position by a pin through the split bushing

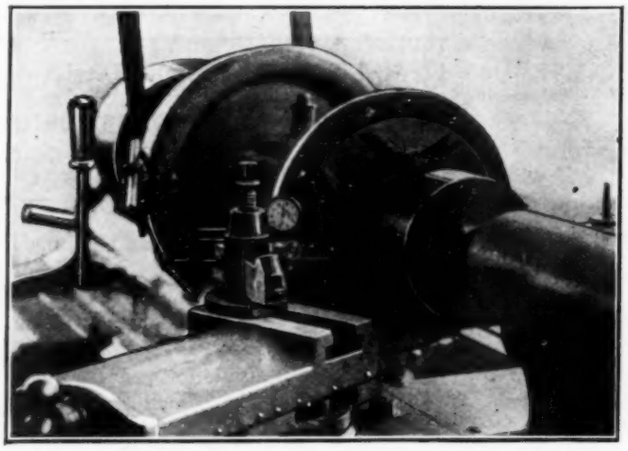

FIG. 18—INDICATING A DIFFERENTIAL MOUNTING

and through a hole in the shaft. The shoulder on the piece *D* fits into the recess for the front camshaft bearing and the nut shown at the right hand end of the shaft is screwed against piece *D*, drawing the shaft through the piece and pulling the rear camshaft bushing into place. To remove a bushing, the same procedure is followed. At intervals on the shaft corresponding to the distances between the camshaft bearings, recesses are turned for the horseshoe collar *E*. When removing a bushing or pulling a new one into place, the shoulder of the collar *F* is slipped into the end of the bushing, one of which is shown at *G*, and the horseshoe collar is slipped into place behind it so that the bushing will be pulled along with the shaft. There are as many recesses on the shaft as there are bearings for the camshaft and it is a comparatively simple matter

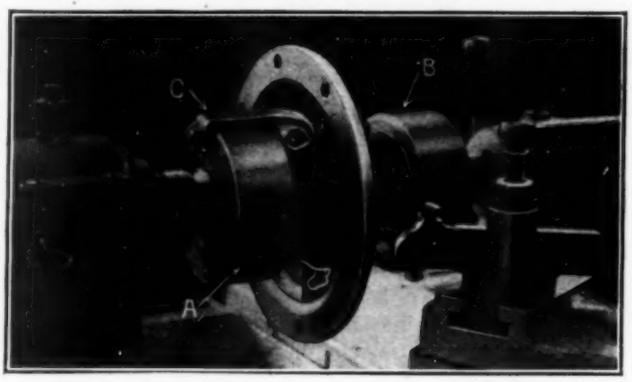

FIG. 19—MOUNTING AND DRIVING MECHANISM

to remove the old camshaft bearings and insert a complete new set.

The piece shown in the lathe in Fig. 18 is a differential mounting, to which the ring gear is assembled when in the car. Whenever the differential is taken apart, the mounting is swung between the lathe centers and

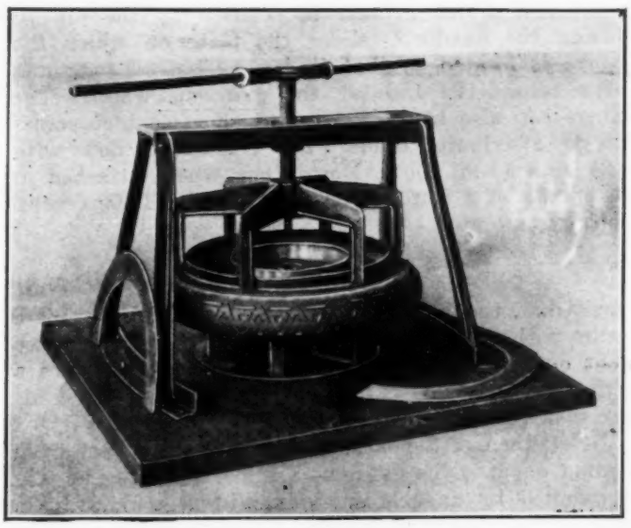

FIG. 20—TIRE REMOVING PRESS

indicated for trueness before it is reassembled. The dial indicator used is shown clamped in the tool post of the lathe. If the indicator shows a variation of 0.003 in. on the side or 0.002 in. on the edge of the flange, a fine cut is taken with the lathe tool as shown in Fig. 19. A perfect job can only be assured by swinging the mounting in the lathe in the same manner in which it is held in the assembly; therefore it must rest in its own bearings. This is made possible by the pieces *A* and *B*, which are bored to the dimensions of the inside of a roller race. A taper shank on the back of the piece *A* fits into the spindle of the lathe, and the piece *B* is centered to revolve on the tailstock center. The piece *C*, which is bolted to the headstock roller race, as shown, drives the piece and prevents it from turning in the race.

The machine illustrated in Fig. 20 is a tire-removing press. After tires have been run 6,000 miles or more without being taken off, as is often the case, they become "frozen" on and require a considerable amount of power to remove them. Before this press was made it was a common occurrence for a workman to spend 2½ hr. with a hammer and sledge trying to separate the rim from the wheel. With this apparatus an obstinate tire can be removed in not to exceed 15 min. The platform on which the press stands is 6 ft. square and is made of heavy oak planks bolted together. The wheel rests on six adjustable jaws, made to slide so that they will take three different sizes of rims. Pressure is applied to the tire by means of the handle shown on the top of the screw. The screw is 2½ in. in dia., and the thread, which is square, is 3 pitch. The screw is threaded through a cast iron nut in the 10-in. U-beam that forms the top of the press frame. To the lower end of the screw is attached a cast-iron spider, the legs of which are bolted to a circle of angle iron. When the tire is in position, the circle is lowered onto the tire, then pressure is applied and the tire is pushed off the rim.

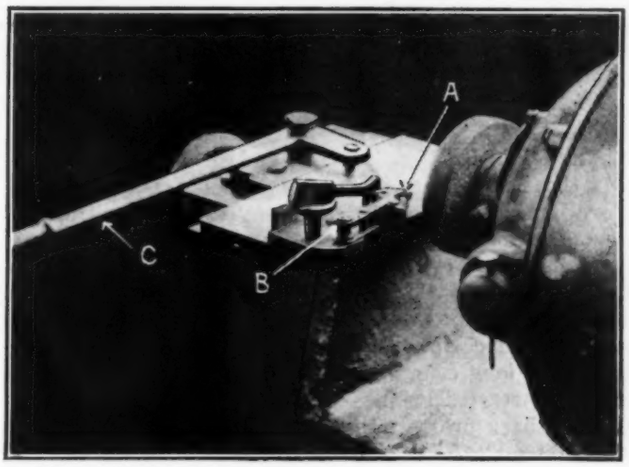

FIG. 22—CONTACT POINT GRINDING MACHINE

An outfit for testing starters is shown in Fig. 21. This consists of a 2 hp. slow-speed electric motor (made by the Jas. Clark Electric Co., Louisville, Ky.) that is wired to a rheostat and to a control board which is exactly the same as those in use in Cadillac cars. The generator that is being tested rests on a steel plate that is attached to the movable jaw of a vise, and is held in place by a metal strap which is also anchored to the jaw and is hinged so that it can be swung up over the generator and locked in place with a wing nut, as shown. By turning the vise handle, the jaw is moved in or out and the belt from the motor to the generator can be released or tightened almost instantly when attaching or removing a generator. The use of the rheostats makes it possible to control the speed of the motor so that the generator may be run at speeds corresponding to the speeds at which it would run when in use on a car. An ordinary car switch is used on the control board, and lights corresponding to those used on a car can be connected so that the generator will be tested under actual working conditions. When the electric motor is running at its maximum speed, which is 1,400 r.p.m., the generator runs at about 2,800 r.p.m., which corresponds to a speed of 40 miles per hour on the car.

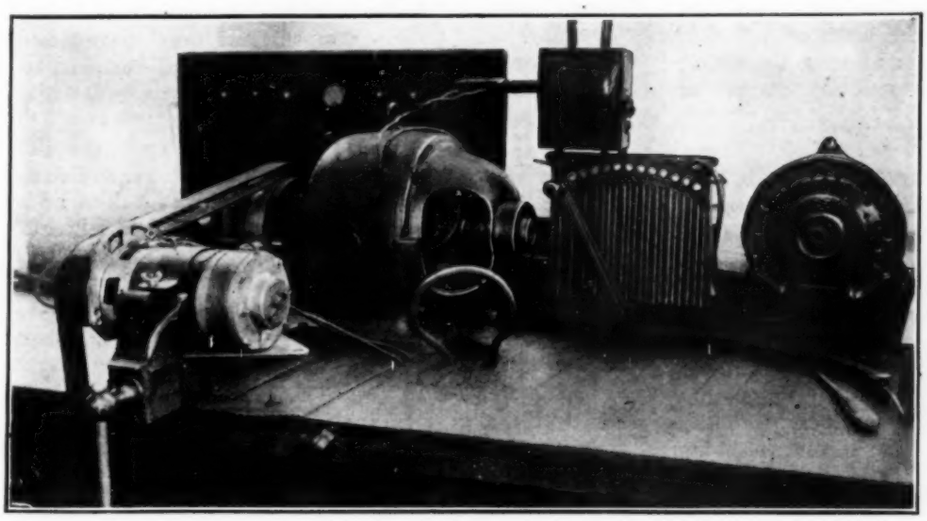

FIG. 21—STARTER TESTING APPARATUS

The ammeter should show 14 amp. at this speed. By turning the knob in the center of the instrument at the right of the picture, the speed of the motor can be increased about three times, thus speeding up the generator to a faster speed than it would be possible to run it on a car, and giving it a thorough test.

A home-built apparatus for grinding the platinum contact points on arms for circuit breakers is illustrated in Fig. 22. The contact point *A* is attached to an arm which is held in position by the pin *B*. Moving the handle *C* slides the plate on which the fixture is located so that it can be passed back and forth across the face of the grinding wheel. The fixture can also be used to grind short contact points for the distributor heads. The grinding is done with a 2½-in. x 1¼-in. 100 L Norton cup wheel, attached to the spindle of a ¼-hp. motor which runs at 1,300 revolutions per minute.

Pipe Dreams of a Tramp Mechanic

We Clean Up the Watchman

BY GLENN QUHARITY

MR. BROOKS, Sr., founder and principal owner of the Brookdell Co., was a genuine old-fashioned "born" mechanic. This does not mean, nor did he assume it to mean, that he ought to know everything about mechanics without having to find it out, for he had worked hard all day, first on his father's farm and later in one of the leading machine and tool shops (then, as now) of old New England, and studied equally hard during the long evenings after his day's work was done, before he started business for himself in the little old wooden shack up by the dam that was the predecessor of the present plant.

He was, however, gifted with a keen intuition in matters mechanical and though in his apprenticeship days he probably made as many mistakes as the average boy, he did not make the same kind of a mistake twice—at least, not very often. He had about him in his later years an air of deliberation that deceived casual acquaintances into believing him to be sluggish and a slow thinker, but, whatever his mental processes may have been, his conclusions were generally right, and when a job was tackled by him or under his direction it was carried through to completion without a hitch or a holdup because of unforeseen difficulties, and in a time that would astonish some of our present-day industrial managers.

HIS MANY VIRTUES

Among other qualities inherited by him from his New England ancestors (some said he was Scotch) were the characteristic Yankee traits of neatness and orderliness, and these traits were not only apparent in his personal habits but were reflected as well by the orderly and efficient arrangement of the machinery in the shop, the clean floors and windows, the well-kept lawns and flower beds and the general air of freshness and newness about the entire plant. He believed—without ever having heard—the modern theory that dirt is "merely matter out of place," and he made a point of keeping it in its proper place.

Many times I have seen the "old man" come out of the office in his Sunday-go-to-meeting clothes (which he wore seven days a week when I knew him) lay off his coat and vest and tackle some greasy job that would soon make the average mechanic resemble an Ethiopian, finish it up to his satisfaction, wash his hands and go back to the office without a speck upon the broad expanse of his "boiled" shirt bosom.

Observing the laws of cleanliness himself he inspired and encouraged others to observe them also, with the result that, though most of us were on fairly intimate terms with grease and dirt during the day, when we went out of the front gate at six o'clock we were a rather respectable looking bunch of citizens—if I *do* say it myself, as shouldn't.

Judge, then, of the old man's consternation when upon coming down to the gate one summer's evening he was confronted by a surly individual in ragged clothing, with soiled face and hands, unkempt hair, and the generally disreputable appearance of having slept off a jag in some convenient ditch.

"Who 're you?" he demanded.

"Th' new night watchman," was the reply.

"Umph; I'm old man Brooks"—and that password was sufficient to get him through the gate.

The next morning the old man blew into the office of Mr. Willians, our superintendent, and wanted to know, "who the devil is that jail bird that thinks he's a night watchman?"

"Why," responded Mr. Williams, "that's the fellow I hired last month to take over the job when old man Emmons passed out."

"Is he a good watchman?"

"Seems to be. Makes his rounds regular and scares everybody away from the place nights. What more do you want?"

"Wish he'd wash his face," grumbled the old man.

"We can't have everything, you know," said Mr. Williams gently. "Night watching is a job for the old, or the physically unfit. Emmons had been here since the Lord knows when, and when he died I had to get *somebody* right away. None of the younger fellows want the job."

"Well! If that's the best you can do I suppose I'll have to stand it," sighed the old man, wearily. "You'd better have a new suit of clothes ready for him and tip off the boys that I shouldn't be very mad if I heard they had soused him in the pond some night when they were in swimming and scrubbed off a few layers of dirt."

The watchman was duly "soused." I know—because I was there.

Using an Electric Drill as a Lathe

BY I. B. RICH

I saw an ironworker the other day who was ingenious, even if his job was simply fitting metal window frames in store windows. He was using an electric drill for making the holes he needed.

In fitting a corner he found that the screw-heads were a bit too large to go in, so he proceeded to use the electric drill as a speed lathe for filing. He put the screw in the drill chuck, laid the drill down on the sidewalk and held it with one knee, while he used the file with both hands to reduce the diameter of the head.

Industrial Cost Accounting for Executives

By PAUL M. ATKINS

The nineteenth article—Expense distribution—Step-ladder and direct distribution methods of allocating expense—Determining and estimating the percentages—The entries in the controlling accounts

THE CLASSIFICATION of expenses for a company, if the cost-accountant has clearly in mind the fundamental principles of expense classification, is not usually a very perplexing task though it requires experience and discretion. The collection of the expenses as they occur offers no theoretical problem where a sound expense classification is at hand. It is true that there are often many practical difficulties encountered in the accumulation of the current expenses, but most of them are common to all cases where it is necessary to handle large masses of details. The distribution of the proper share of the expenses to the various units of product as they are made, however, is one of the most difficult problems in cost-accounting and one which is least frequently solved in a satisfactory manner.

In reality there are two steps in the distribution of expenses to the product and too often the attempt is made to combine them with the result that confusion in both theory and practice is a consequence. The first step—the one to which this chapter is devoted—is the distribution of the expenses of the auxiliary manufacturing departments and a certain part of the expense of the administrative departments to the direct manufacturing departments. The second step is the allocation of the earned burden to the product as it goes through the direct manufacturing departments. The earned burden is a certain part of the departmental burden which is made up of the expenses of the direct manufacturing department plus the share of the expenses of the other departments which have been assigned to it.

The reason for the necessity of two steps is evident if we analyze the problem a little. The only real basis for making a charge to the product is because a service has been rendered to it in some way. It is obviously incorrect to charge to one order material which is used for another, and it is equally clear that it is incorrect to charge against the manufacture of a certain part labor which has been expended in repairing a machine. It is just as unsound, though not quite so easily appreciated, to allocate expenses to an order which do not in some way measure services rendered to it. It is rather difficult, however, to try to decide how much of the expense of the purchasing department or of the power department should be assigned directly to an order going through the assembly department or the machine shop. In fact, it is a practical impossibility. It is possible, on the other hand, though not easy, to measure the services of the power department to the machine shop and to allocate the power department expense in the same ratio as the service. For the purchasing department, it is not quite so easy, but by tracing the service of the purchasing department to the various departments it aids, the expense of operation of the purchasing department can be transferred to the various direct manufacturing departments.

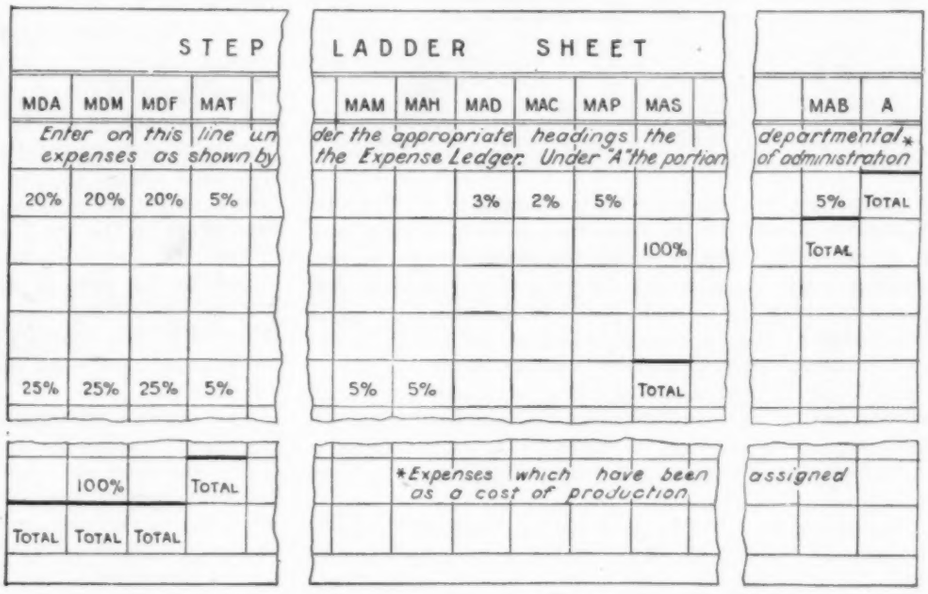

FIG. [illegible]—STEP-LADDER SHEET FOR EXPENSE DISTRIBUTION

We lay down the general rule, then, that the expenses of the different departments shall be distributed in the same ratio as their services. It is only a general rule and one which it is not practical to follow literally very frequently, but it does serve as a guide and establishes a sound basic principle to follow in the matter whenever it is possible. Few cost-accountants seem to realize the significance of the principle and even when they do, they pass over the difficulties in the way of its practical application by saying that the expenses should be distributed on some appropriate basis, but seldom is any clew given as to what may be considered ap-

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propriate. The entire failure to departmentalize burden which so often goes hand in hand with the omission of any departmentalization of expenses cannot be condemned too severely. There is practically no case where burden applied without regard to the department in which the work is done is correctly allocated. It must be remembered that incorrect costs are worse than no costs for the executive is inclined to rely more or less on them and may be seriously misguided as a result.

The methods which are discussed in the following paragraphs are far from perfect, but they do represent, however, an honest attempt to work practical means for expense distribution and it is hoped that they will serve the reader as a guide in solving his own problems. They have been tested in actual practice and have proved to be satisfactory under a variety of conditions.

The first method is commonly called the step-ladder method because of the resemblance of the form which

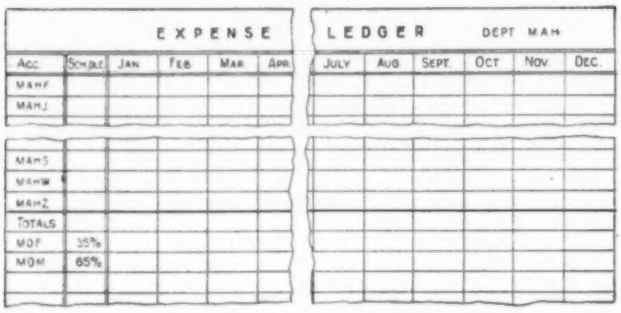


FIG. 49—EXPENSE LEDGER SHEET FOR AN AUXILIARY MANUFACTURING DEPARTMENT

it takes to a step-ladder. It is illustrated in Fig. 48. The arrangement of the departments is in such a way as to place the ones to which the most service is rendered by other departments to the left of the sheet and those to which the least is given to the right. A good knowledge of the functionalization of the business and the interrelationship of the various departments is needed. It is not necessary that a department shall render service to every department to its left, but the total amount of service rendered to it by the departments on its right must not exceed that which it gives to those on its left.

We are at once confronted with a practical problem as soon as we try to establish the arrangement. We find that the services among the various departments have a tendency to circle in such a way that it becomes theoretically impossible to place them in a straight line. A single example may help to make plain the difficulty. The purchasing department's chief service is to the stores department in keeping it supplied with material; part of the work of the stores department often lies in caring for the coal and other supplies used by the heat, light and power department; but the latter department warms and lights the purchasing department.

Let us see how this condition affects the expense distribution if we follow literally the theory outlined. Most of the expense of the purchasing department should be distributed to the stores department. But the total amount chargeable to the purchasing department cannot be ascertained and hence it cannot be distributed till a portion of the cost of operating the heat light and power department has been allocated to it and the total for this department cannot be ascertained till a part of the expense of the stores department has been distributed to it. The last figure cannot be found till a part of the expense of the purchasing department has been attributed to it. Hence we see a vicious circle is set up which must be broken somewhere.

In the example given it is not difficult to see how the problem may be solved. The part of the cost of the heat, light and power department to be assigned to the purchasing department is obviously very small in amount, so small, in fact, that it can be neglected without giving rise to any appreciable error. Hence these three departments can be arranged from right to left as follows: purchasing department, stores department, heat, light and power department, and the distribution made without any difficulty.

If it proves to be impossible to deal with the question so easily because the services of one department to another are so evenly balanced as not to permit omitting altogether the exchange of costs, another method may be adopted. The departments should be arranged in the most logical order possible as has been described. A certain percentage of the expenses of the department to the right which serves a department on its left should then be transferred back to it, in this way crediting the department on the left and debiting the one on the right. This procedure is not altogether satisfactory but it allows the solution of what might otherwise be a bothersome problem.

Departmental Expense Distribution

When the departments have been arranged in the proper order, the total expenses for the month for each should be entered on the top line of the sheet under the respective departmental headings. The actual distribution then begins by the application of the percentages shown under the several departmental headings on the base sheet to the total expense of the first department at the left, and the allocation of the amounts so determined to the several departments. In this way the amount of the expense of the first department is distributed to the others in the proportion of its service to them as closely as the ratio of that service can be determined.

The expense distribution of the next department to the right is made up of the expense which it incurred in its operation plus the amount apportioned to it from the first department. The sum of these two items is allocated to the remaining departments to the right in the same manner as the expense of the first department. The total charge of the third department is next ascertained as has been described for the second department, and then distributed like the others. The process continues till the entire expense of the several auxiliary manufacturing departments and such portion of the administration expense as is to be allocated to the manufacturing have been transferred to the direct manufacturing departments. Of course, in making the transfers it is not at all necessary that a department shall have some of its expense assignable to every department to its left. If it has rendered no service to one or more of such departments, the departments will receive no expense from it.

The second method, the direct distribution method as it has been called, is illustrated in Figs. 49 and 50. The expense ledger sheets, of which only parts are shown in the illustration, are the same as those illustrated in Fig. 47 of the sixteenth article of the series—The Recording of Expenses. The portion shown in Fig. 49 is for an auxiliary manufacturing department

from which the expenses are to be transferred and in Fig. 50 is shown the expense ledger sheet for a direct manufacturing department to which expenses from the several auxiliary manufacturing departments are to be allocated.

The fundamental principle underlying the method is the same as for the step-ladder method. The attempt has been made to eliminate some of the detail which is involved in the operation of the first method by making transfers from auxiliary manufacturing departments only to direct manufacturing departments, in this way omitting all inter-auxiliary departmental transfers. On the ledger sheets for auxiliary manufacturing, there should be recorded in the schedule column the percentages of the departmental expenses to be allocated to the several direct manufacturing departments indicated in the column at the left. When the percentages are applied to the scheduled expenses of a normal period the resulting sums are the amounts to be used in making up the departmental burden rates in the several manufacturing departments.

Allocation of Expense by Percentages

The percentages should be applied each month to the total expenses of the department for the month and the result will be the amount to debit to the direct manufacturing department indicated. The entry corresponds to the crediting of the expense account in the normal type of ledger account. At the same time the sums should be transferred as debits to the direct manufacturing department expense ledger sheets where they are entered below the totals of the expenses of the department itself. The expense ledger for the latter departments also serves as a departmental burden journal for the sum of the departmental expenses and the amounts transferred from the other departments make up the burden for the department.

The methods as they have been described are not difficult to operate; the perplexing part of the problem comes in determining one element of both methods—the percentages of the auxiliary departments aided. We have already discussed one trouble which is often met—the circling of services—and we have seen how it may be handled. The other phase of the question is to measure the amount of service rendered by one department to another for if that can be done it is easy enough to determine percentages or ratios.

In some cases the measurement does not present any serious difficulty. It is possible to say in many cases that the purchasing department devotes practically all its time and energy to buying materials for the storeroom in order to keep up the latter's supply. The time given to the purchase of other items is so little as not to be forth while considering. Hence, the entire expense of the purchasing department may be transferred to the stores department if the step-ladder method is used, or it should be allocated to the direct manufacturing departments in the same ratio as the expense of the latter department if the direct distribution method is employed.

This fact leads at once to the question of how the expense of the stores department is to be allocated. There are several bases on which a ratio might be established. It would be possible to say that the weight of the materials sent out to the several departments would be a good measure of the service rendered. It would be if the materials are sufficiently homogeneous, but if some of them are castings that can be stored anywhere in a shed or even in the open, and others are materials such as platinum or silver that must be handled very carefully and protected against loss, then it is evident that weight will not furnish a good measure.

Another possibility is to use value and we find that much the same thing can be repeated here that was said in the preceding paragraph. If the material is sufficiently homogeneous in respect to value this method will work out well, but if the situation is like that described above, then the results of using value for a basis are not likely to prove satisfactory. Still another possibility is to use the number of units sent out to the several departments as a means of establishing the desired percentages. The method is subject to the same limitations as the others. It should be said, however, that in a large number of cases the material is sufficiently homogeneous so that one or another of these bases may be successfully employed. To accumulate such data requires additional records to those already made for the control of material, but it must be remembered that it is not necessary to accumulate the information for any great length of time. Test runs or records kept for a day or so each week for a few months or a week each month for half a year will ordinarily give sufficient data for the satisfactory determination of the needed ratios. When they have once been established it is not ordinarily necessary to change them except when some radical alteration is made in the organization of the business.

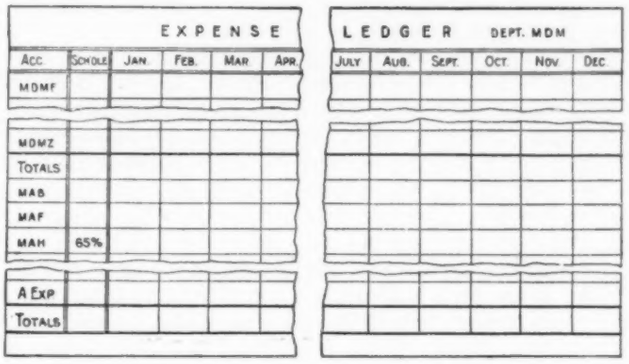


FIG. 50—EXPENSE LEDGER SHEET FOR A DIRECT MANUFACTURING DEPARTMENT

If it is not possible to use any of these bases for determining the proper percentage of expense distribution there is still another method which may be employed, a method which may be utilized whenever no other way of securing the desired results is at hand. Several individuals who are in a position to evaluate the services rendered by the department in question should be called upon to express their opinion in writing, to set down the percentages which they believe should apply. If this work is done by each independently there will be no chance for one to influence the others. The statements should then be combined and the result taken as the percentages to be used for the expense distribution. By combining the opinions of a number of individuals personal biases may be eliminated and the result may be taken as a fair evaluation of the situation.

Only persons who are in a position to form a sound judgment should be asked for opinions in such a case. In the instance discussed above, the storekeeper, chief balance clerk, factory, production and assistant production managers and the cost-accountant himself are the

ones who are likely to be best equipped for the task. If the position of one of the men is such as better to fit him to form a sound opinion, his estimate should receive greater weight than the statement of the others. It often happens that someone relatively low in the organization may be much better equipped than some one higher up to evaluate correctly the distribution of services. The storekeeper, for example, is in much more intimate contact with the details of the stores problem than is the factory manager.

It is also quite essential that all those who are to be called upon to aid in the matter should be provided with all the information which is at hand, or which can be easily collected, to guide them. In other words, the estimates should be real estimates based on such facts as are available and on personal experience with the problem, and not mere guesses. It is important also that only those persons who are properly equipped should be selected for the task. It is not at all necessary that the same men should always be on these committees. Some, like the cost-accountant, are apt to be available in connection with a number of departments and others may be used for only one.

Space will not permit a detailed discussion of the working out of the percentages for all possible departments so only two other illustrations will be very briefly discussed. The expense of the maintenance department deserves consideration because it often happens that it is not thoroughly understood, though it is really one of the easiest of the departments to handle. Most of the sums paid for maintenance material and labor are, of course, charged directly to the maintenance accounts of the departments which are benefited. Hence, they do not form any part of the expense of the maintenance department itself. There is, however, a little expense of the department such as the salary of the foreman, a part of that of the plant engineer, and many others who may supervise the maintenance work. There are also costs for power, fixed charges and maintenance of the part of the building and equipment occupied by the maintenance department exclusively.

The sum of these expenses make up the departmental expense and must be distributed in the same general manner as the other auxiliary departmental expenses. In this case the sum of the charges to the departmental maintenance accounts may well be selected as the basis for the distribution. The figures are easily obtained and serve quite well to measure the cost of the service of supervision of the work which they represent. The method can be used for either the step-ladder or direct distribution methods. If the latter method is to be employed, only the maintenance accounts in the direct manufacturing departments will be used.

Distribution of Administration Expenses

The administration expenses present a somewhat distinct problem. It has already been pointed out in a preceding article that one way of disposing of them is to charge them to the profit and loss account. The method is convenient but it does not show the real cost of production since the cost of the administrative services are not taken into consideration. In general it is better to lump all the administrative expenses before they are distributed and to treat them as the cost of the administration of the business which benefits production and selling. They are divided into departments, it is true, for care of control, but when considered in relation to the two other main divisions of the business it can well be treated as a unit. In some few cases it may be wise to distribute the expenses of certain administration departments separately from the rest of the group, but the statement made above in general holds true.

If the step-ladder method of expense distribution is employed, the percentages must almost certainly be worked out by the estimating method. If direct distribution is employed it is often quite satisfactory to take the value of the direct labor cost or the direct labor hours as the basis since the administration expenses usually represent the cost of supervision.

The Entries in the Controlling Accounts

So far the entire article has been given up to a discussion of details, but before closing it a few words about the general ledger entries are necessary. The controlling accounts for direct and auxiliary manufacturing expenses should be closed by a general journal entry into a manufacturing burden account. The part of the administration expenses distributed to manufacturing departments should also be closed into the account by means of the same kind of entry. The account would then appear much as follows:

Manufacturing Burden Account

General journal (total amount of the auxiliary manufacturing department's expense for the period. Credit therefore to the auxiliary manufacturing expense account.)

General journal (total amount of the direct manufacturing department's expense for the period. Credit therefore to the direct manufacturing expense account.)

General journal (the part of the expense of the administration departments for the period to be charged to cost of production. Credit therefore to the administrative expense account.)

The credit entries to the account will be explained in the following article where the general subject of burden is discussed at some length.

The whole subject of expense distribution is one of the highest importance to the executive who wishes to have a cost system which will give him reliable information. It is a part of cost-accounting which presents many difficulties and is not easy to grasp at once, and hence it deserves fuller consideration from both the cost-accountant and the manager than those sections which can safely be left to subordinates.

American Automobile Prohibited in Germany

The German automobile manufacturers, in order to protect their own interests, especially against foreign competition, have organized themselves into a syndicate called the "Verein Deutscher Motorfahrzeug Industrieller." This syndicate has been powerful enough to induce the Government to prohibit the importation into Germany of automobiles, motor trucks, tractors, and most automotive products, according to *Commerce Reports*, published by the Department of Commerce.

The end of the war in 1918 found the German automobile industry in a completely disorganized condition.

LeBlond Vocational Training Course

By W. H. Myers

IT IS the policy of the R. K. LeBlond Machine Tool Co. to develop apprentice training to as high a standard as is possible in the industry. Our present apprenticeship system, or vocational training course as we prefer to call it, is the outgrowth of the old method of employing boys as apprentices, placing them in some department of the plant and then forgetting their existence until their time was up and they were given the $100 bonus and called journeymen.

This condition existed until the year 1919, when it was discovered that the shortage of skilled mechanics, which then existed, was due almost entirely to the fact that the journeymen who had completed their apprenticeship in the past few years were not up to the proper standard. This, of course, was entirely due to the fact that they had either been neglected entirely during the rush of the world war, or had been allowed to remain in one job or on one machine during the major part of their apprenticeship period.

Beginning of the Training School

It was at this time that this company instituted its vocational training course. A suitable place, apart from the machine shop and located on the fourth floor of the administration building, was fitted up with all the different types of machines used in the plant. An instructor and assistant were placed in charge of the department, which is known as Department 15, Training School.

It is in this school that each apprentice or student, as we call him, begins his course. Here he is taught the use of measuring instruments, and also to operate one, or possibly two, types of machine tools on actual work. It is the aim to handle all repair jobs in this department, on account of the variety of the work required. The student is kept in the training school for a period depending upon his ability to learn. After being graded as proficient by the instructor, he is then sent to the department in the plant which uses the machines he has just learned to operate.

After six months in this department the student is again transferred to the training school where he is taught to operate another type of machine. This systematic training and practice continues throughout the course so that at its completion the student has a fair knowledge of all important departments and operations.

Three Hours per Week in the School Room

In addition to the shop training, the student is required to attend the school, which is conducted by the company in a school-room, properly equipped with all the necessary equipment. The time spent in the school is three hours per week. The school is in session during working hours, and the student is paid at his regular working rate for the time spent there. He attends this school throughout the entire length of the course, and is taught arithmetic, algebra, geometry, trigonometry, mechanical drawing, cost accounting, rate setting, economics and English. The last two subjects, while not absolutely essential, are given to broaden the student's view and make a better man out of him.

In the selection of boys suitable for our vocational training course, we have adopted a method which has proven satisfactory.

In the boy's first application we get all the information possible concerning his past employment. We then investigate his records from the schools he has attended, and also his home conditions. After this we are fairly sure as to whether he will be suitable material for a machinist, draughtsman or patternmaker. His first three months in our employ is a period of probation, and during this time he must be satisfied with his work and must also satisfy us as to his ability. If everything proves satisfactory, he then signs an agreement which is executed in legal form by his parents or guardian and the company. In this agreement the student agrees to work for the company faithfully for the full term of the course, and the company, in turn, agrees to teach him the fundamentals of the machine tool industry.

It goes without saying that a boy with no knowledge of a machine will learn to operate it more correctly and in a much shorter time when guided by a competent instructor, than if shown the machine and told to learn how to run it, as in the old days. It is also much better for the machine itself.

The writer served his time in an old-time shop, which was large enough to employ some twenty "bell hops," as we were familiarly called at that time. I was given no instruction whatsoever, and only told to watch the man next to me.

In great contrast is the well planned course described above in which all students receive the same thorough training. Students who have an aptitude for the work and a seriousness of purpose are selected, and the course is becoming so well known all over the country that at this time there is a large waiting list.

Trade Practices Adopted by the Electric Steel Founders' Research Group

The following standard trade practices were adopted by the five companies forming the Electric Steel Founders' Research Group, at their meeting in Pittsburgh, Pa,, held on June 16, 1923.

1—Suitable pattern equipment for economical molding shall be furnished by customer.

2—The foundry will not be responsible for correctness of pattern equipment to blueprint, except when such equipment is made for the customer under the supervision of the foundry.

3—Repairs on pattern equipment shall be paid for by the customer, except when occasioned by carelessness on the part of the foundry.

4—Patterns must have distinctive colors to identify separately the coreprints, machined surfaces, and rough castings.

5—All patterns, coreboxes, and loose pieces thereof, must be properly numbered for identification.

6—All transportation charges on pattern equipment to and from foundry shall be paid by the customer.

7—The foundry will not carry insurance on customers' pattern equipment.

8—Free replacement will be made of defective castings if reported and returned to foundry within a reasonable time.

9—The foundry will not be responsible for any expense on defective castings incurred by the customer.

10—The customer will be charged with the cost of molds and cores discarded by the foundry, due to change in patterns or coreboxes.

Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for

A Much Widened Planer

BY FRANK C. HUDSON

During the war, Seattle, in common with several other cities, was almost overwhelmed with orders for engines and machinery for vessels for the emergency fleet. One of the concerns which had a lot of this work to handle was the Hendricks Manufacturing Co., who had, among other things, a number of marine

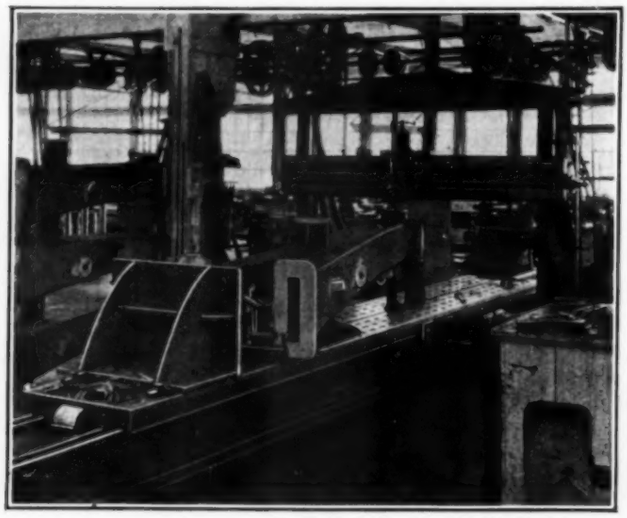


FIG. 1—THE FIRST WIDENING

engines to build for the Shipping Board. The frames of these engines were large castings and the largest planer in the shop would plane only 48 in. wide. Large planers were hard to get, so the housings of the 48-in. planer were spread apart by filling pieces built out from the bed, a new cross-rail and beam were made, and the engine frames handled as shown in Fig. 1.

Then another and bigger job came along and the widening process was repeated as shown in Fig. 2, this time to about 120 in., making almost, if not quite, a record breaker in the widened planer line. Fig. 2 shows the method of driving the planer even better than Fig. 1, both the power for the table and for raising and lowering the cross-rail being taken from the same shaft. The belts for operating the cross-rail can be shifted from the right-hand end of the rail, as we see it, and the motion reversed at will.

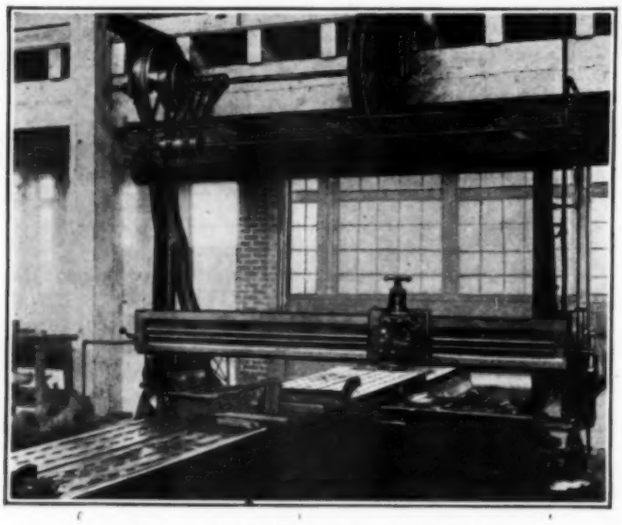
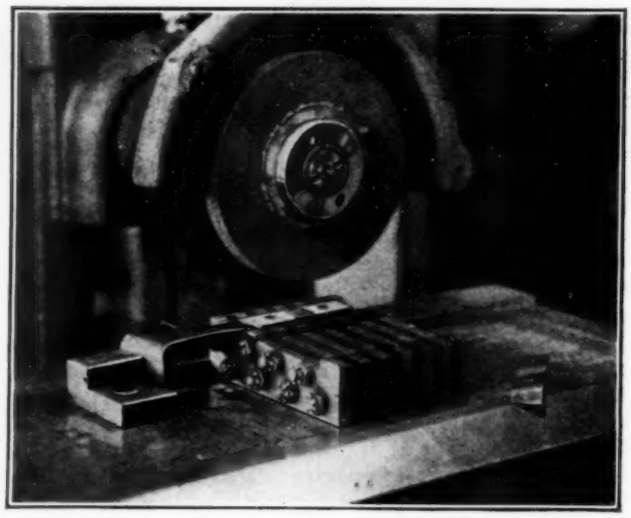


FIG. 2—WIDENED TO 120 INCHES

Auxiliary Magnetic Chuck for Holding Irregular Work

BY TOM J. O'REILLY

There are times when work could be expedited by the use of the magnetic chuck, if there were some means of holding irregular work. An auxiliary mag-



AUXILIARY MAGNETIC CHUCK

netic chuck, shaped to accommodate the angle on the piece to be seen lying on the face of the magnetic chuck, is shown in the accompanying photograph. The auxiliary chuck is made of alternate sections of steel and fiber, bolter together. Sections of fiber tubing around the bolts insulate them so the current has to travel through the work. The angle of the slot across the top of the auxiliary chuck corresponds to the angle on the work, so that when the piece is in position, the back of the work is ground square with the sides. A stop block is used, as shown, in order to prevent the work being pushed out of the chuck by the action of the grinding wheel.

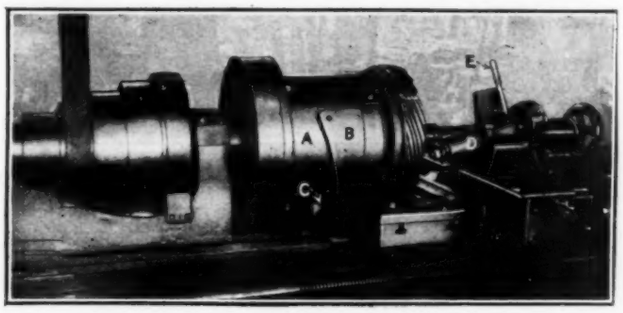
Cutting Helical Gears in a Lathe

By Milton Wright

An ingenious adaptation of an engine lathe to the cutting of helical gears is shown in the accompanying illustration. The gear to be seen in place on the fixture is 21.803 in. in diameter and has 31 teeth of 15-deg. helix angle. The device is in regular service at the plant of the Automatic Machine Co., Bridgeport, Conn., in which shop it was devised for the cutting of gears to be used in connection with steam turbine work.

The part *A* of the indexing fixture is a shell of cast iron, having a flange by which it is bolted to the face-plate of the lathe and bored to take a large-diameter stud, or arbor, upon the outer end of which the gear to be cut is mounted. An index plate having a number of notches in its periphery corresponding to the number of teeth to be cut in the gear, is a part of this stud and it is held in relation to the shell by a lever-operated locking pin, which passes through the wall of the shell and enters the notches of the plate.

A cam plate *B* is screwed and dowelled to the outer circumference of the shell, the inclined face of which



CUTTING HELICAL GEARS IN A LATHE

cam plate bears upon the roll *C*, the latter being carried upon a stud at the center of a bridge casting which passes under the shell and cam and is bolted, front and rear, to the wings of the carriage. A similar cam plate bolted to the remaining circumference of the shell (out of sight in the picture) bears against the opposite side of the roll during approximately one-half of each revolution of the lathe spindle.

In the operation of cutting the gear teeth, the lathe revolves continuously and the carriage is moved forward in harmony with the angular advance of the helix by the cam plate *B*, and then back to its original position by the return cam plate, making one complete cycle for each revolution of the lathe spindle. The lead screw of the lathe has nothing to do with this movement; in fact, as the lathe is kept set up for this work exclusively, the entire apron has been removed from the carriage

The return cam plate is permanent and serves for all gears within the range of the device. The cam plate *B* is easily removable by taking out four fillister-head screws, and other plates of different angular advance may be substituted to cut gears having different helix angles. The index plate on the central stud is also removable and others may be put on to cut different numbers of teeth in the gear.

The cross-slide of the carriage is left in its normal condition and may be fed forward at each cycle by turning the handle of the cross-feed screw, the amount of movement for obtaining the successive increments of cut being governed by a micrometer stop in the manner usual in ordinary thread cutting. The final position of the cross-slide, when the proper tooth-depth has been reached, is determined by a permanent stop.

The cutting tool is a special, formed gear-tooth cutter having but four teeth. But one tooth is used at a time, however, and the reason for having four instead of a single tooth, is that it involves no added expense to make it this way and the life of the tool is thereby multiplied by four. The bore of the cutter has four keyways to correspond to the four possible positions.

How the Cutting Tools Are Held

The tool-holding fixture *D* is a casting securely fastened to the tool-slide. The cutter is held upon the end of a spindle passing through the barrel of the fixture in such position that its axis is parallel in vertical plane with the center line of the lathe but inclined to the horizontal plane by an angle complementary to the helix angle of the gear to be cut.

The spindle upon which the cutter is held, is capable of partial rotation within the barrel, under control of the lever *E*, its forward rotation being limited by a fixed stop. As shown in the illustration the tool is in cutting position. The stud to which the cutter is keyed is eccentric to the axis of rotation of the spindle so that when the operator pulls the lever *E* backward and downward, the cutter is given a partial backward rotation and at the same time is drawn away from the work.

With the gear blank in place, the operator starts the lathe and swings the lever *E* up to the position in which it is shown, where it remains while the carriage is moving toward the headstock under the action of the cam plate. When the cutting movement is completed and before the carriage starts to move back to its original position, the lever is swung downward, turning the cutter back to clear the work on the return movement. After each pass, the cross-slide is fed forward by an amount determined by experience as to what the tool will stand, and regulated by the micrometer stop.

When one tooth of the gear is completed, the lathe is stopped, the cross-slide drawn back and the blank advanced one notch of the index plate in readiness for cutting the next tooth. In practice it is found advisable to go around the gear twice, the first turn corresponding to the roughing cut, and then resetting the cutter to an unused tooth and going over the gear again to remove a small amount of material from each tooth for the finishing cut.

Range of the Device

The device is adapted to the cutting of gears of from 16 to 21 in. approximate diameter and of helix angles varying from 14 to 16 in. linear advance for each complete turn. The cam plate *B* must, of course, correspond to the angular advance of the individual job and the number of notches in the index plate to the number of teeth in the gear.

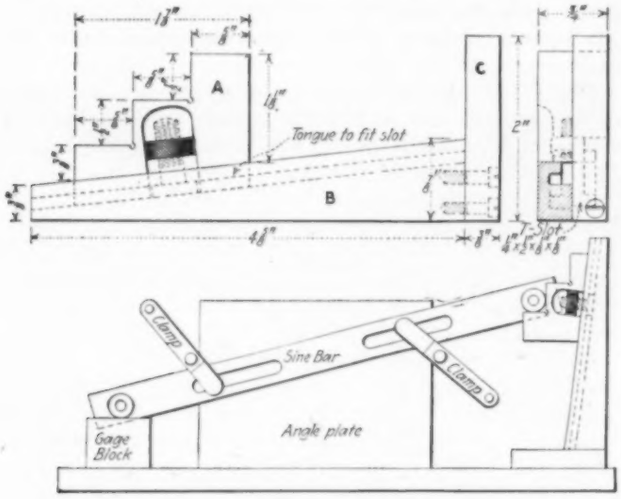
The operation is not different from the cutting of multiple-threaded screws, except that a cam is substituted for the lead screw of the lathe to obtain the necessary traverse of the carriage. The time of cutting varies with the size of gear and number of teeth and to some extent with the nature of the castings; all of which are of bronze. The minimum time is about 35 min. and the maximum has never exceeded 1½ hr. on the largest sizes.

Adjustable Height-Block for Setting Sine Bars

By J. W. Rice

In using sine bars there is often much time lost in making or finding blocks of the right height with which to set them. Here is a useful tool that will be found handy and dependable for this, as well as for many other purposes. The dimensions given in the sketch cover the range of a sine bar with 5 in. centers, which is a common and convenient size.

The adjustable block *A* has a tongue fitted to slide freely but without shake in the groove of part *B*, to which it may be clamped by means of the T-head screw and knurled thumb-nut. A pocket milled in part *A*



CONSTRUCTION AND USE OF HEIGHT BLOCK

allows the nut to be so placed that it is below the surface and does not interfere with laying the tool upon its side.

Part *C* is permanently attached to part *B* and the whole should be ground accurately square in all directions. The faces of the measuring steps should be finally ground after the tool is assembled. Setting for height, either way, is accomplished by measuring over opposite faces with a micrometer.

Turning an Oversize Job

By Clifford H. French

Blocking up the lathe to turn an oversize job has probably been practiced ever since we had lathes in machine shops. In many cases, however, new methods have to be adopted or old ones changed to some extent, on account of condition of the lathe or the work. The case illustrated herewith is from the shop of Hesse & Ersted, of Portland, Ore. The illustrations show a flywheel about 6 ft. in diameter by 15 in. face, held on the faceplate of a lathe which originally swung about 44 in., both the head and tail stocks having been raised by blocks in the usual way.

Fig. 1 shows the second operation, consisting of boring and facing the outer edge. The other edge and the face, as well as the bore of the hub were machined at the first setting.

Four arms *A*, Fig. 2, are bolted to the faceplate, and project over the edge, so that the spacing blocks *B*

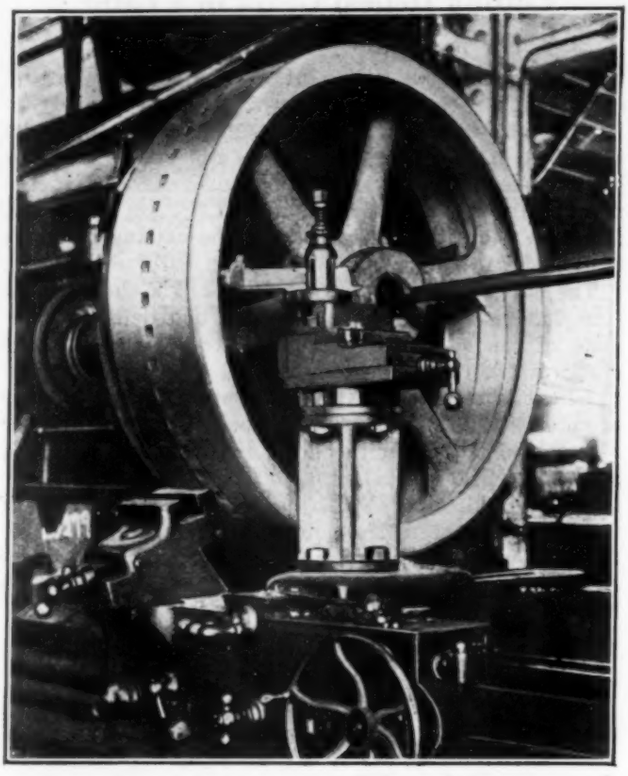


FIG. 1—TURNING A FLYWHEEL LARGER THAN THE LATHE

can be bolted to them. The outer blocks are longer than the rest, and project inwardly, as shown at *C*. These projecting blocks form the support for the inner edge of the flywheel rim, and also a seat for the C-clamp used in holding the flywheel in position for turning. The bar *D* is largely a precautionary measure, as the clamps do most of the holding and all of the

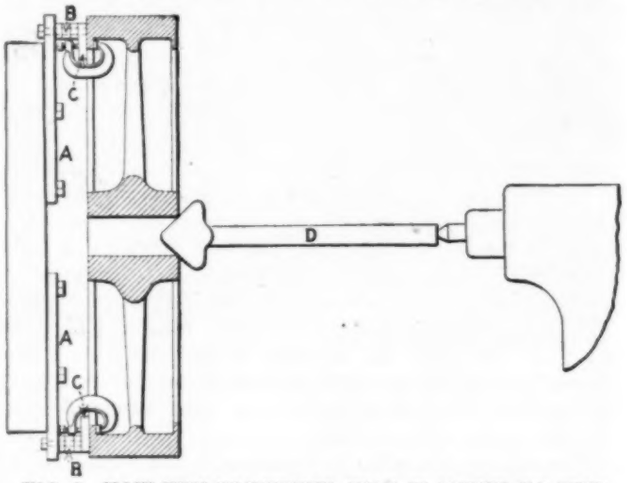


FIG. 2—HOW THE FLYWHEEL WAS CLAMPED TO THE FACEPLATE

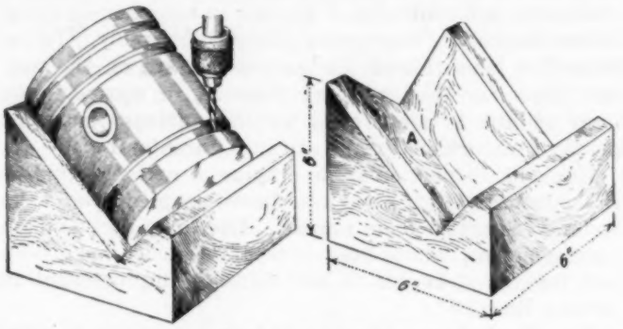
driving of the work. The end of the bar *D* is flattened to about ½ in. in thickness.

With the hub bored, the rim turned, and one side faced at the same setting, the greater part of the work is done, and the true running of the wheel assured. The second chucking is comparatively simple, as after the first side of the rim is faced, it squares itself on the blocks *C*, and it only remains to adjust the wheel until the outer diameter is running true.

A Wooden Fixture for Drilling Pistons

By Geo. A. Luers

The drilling of oil drain-holes through the groove at the bottom ring of a gas engine piston is a job which can easily result in breaking many drills unless the piston is held properly in some fixture. The practice in many cases is to clamp the piston against an angle



SIMPLE FIXTURE FOR DRILLING PISTON OIL-HOLES

plate on the drilling machine table. But if the piston moves under the pressure of the drill, off goes the point.

The simple fixture shown herewith illustrates a method which has proved very useful in drilling the diagonal holes. A 6-in. square block of oak is cut so as to seat the skirt and side of the piston.

The groove at *A* holds the piston from rolling. The fixture can be built up of separate pieces if more convenient.

Boring and Turning Spherical Bearings

By Herbert F. Crawford

Some of the various companies for which the General Iron Works, Denver, Colo., does the machine work, use a number of large sized bearings in which the bearing shell is mounted in a spherical seat. The machining of both the shell and the seat is accomplished by very

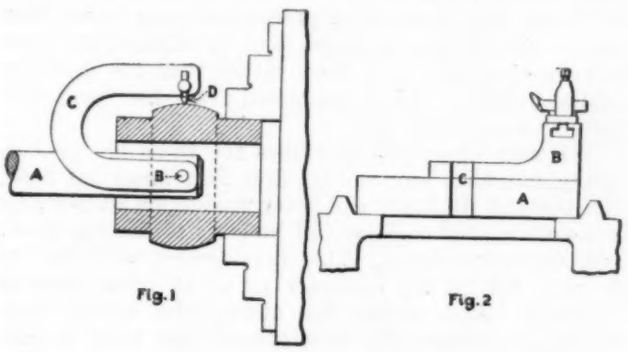


FIG. 1—TURNING A SPHERICAL SHELL. FIG. 2—ANOTHER DEVICE FOR THE SAME PURPOSE

simple fixtures, which are illustrated herewith. Fig. 1 shows one of the bearing shells held in the jaws of a lathe chuck. The bar *A*, of as large a diameter as can be used in the bore, is fastened to the tailstock and run into the shell, so that the pivot pin *B* comes in the center of the desired radius. The bar is flattened on top to accommodate the swinging arm *C*, which is pivoted at *B*. The outer end of the arm *C* is fastened to the toolblock and carries the turning tool *D*. As the tool is moved along by the carriage, it describes an arc around the pivot *B*. The toolpost is so well supported by the toolblock that a fair sized cut can be taken.

An improved method of doing this job is shown in Fig. 2, this device being under way at the time of my visit. It consists of a substantial base block *A*, which fits between the inner ways of the lathe and carries the toolblock *B*, which is pivoted at *C*. The desired diameters are secured by setting the tool forward in the toolpost. The toolblock *B* is to be swung by a connection from the lathe carriage.

The bearing to receive this shell was being bored at

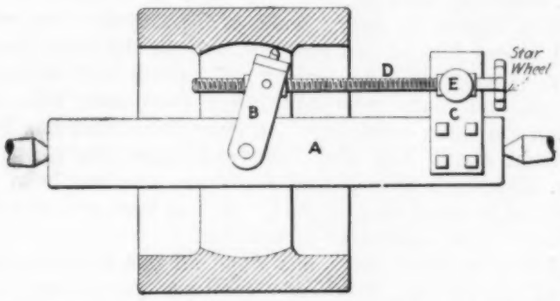


FIG. 3—BORING THE BEARING TO FIT THE SHELL

another plant of the General Iron Works by the device shown in Fig. 3. The operation is self-evident, the apparatus consisting of the bar *A*, the swinging arm *B*, which carries the boring tool, and the stationary arm *C* bolted to the bar for carrying the feed screw *D* in a swiveling bearing at *E*. The feed is obtained by a star-wheel on the end of the screw in the usual way.

Saving Hacksaw Blades

By W. Bradley
Horwich, England

Unless good care is taken when using the hacksaw to cut thin stock, some of the teeth are apt to break off, generally one or two at a time. When this happens, although the saw may have been in excellent condition at the time, it is not long before more and more of the

HOW THE SAW SHOULD BE GROUND

teeth will be knocked off by constant collision with the work, so that before long there are practically no teeth left. This difficulty may very easily be overcome by grinding a few of the teeth taper at the end of the fracture, as shown in the accompanying sketch. This has the effect of causing the saw to rise and slide up from the bottom of the teeth (where it has naturally fallen) to its proper cutting level without any hard jar. It will be found that when a saw is treated in this way there will be no further breakage at this point.

American Machinist
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KENNETH H. CONDIT AND FRED H. COLVIN
Editors

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The Passing of a President

THE NEWS of the untimely death of Warren G. Harding came as a severe blow to citizens of the United States in every walk of life. Every one who had known him or had met him only in the most casual way experienced the feeling of having lost a warm friend and many who had never even seen him had much the same sentiment. In everything that has been written about him since the end came the sense of Mr. Harding's friendliness for every one has been expressed in some way or other. It has been a wonderful tribute to the character of the man.

After the first shock has worn off one finds a somewhat conflicting flood of emotions possessing him. Among them is surprise at the almost complete lack of flurry or excitement incident to the unexpected transfer of the reins of government from the hands of one man to those of another. One reason for this may be the wise policy which provided Mr. Coolidge with a place at all cabinet meetings and thus kept him closely in touch with all that went on. The stock market, usually our most sensitive barometer to such national calamities as the death of a chief executive, has been affected hardly at all.

There is a general feeling of confidence that President Coolidge is eminently fitted to take up the heavy burden of directing the administration through the crucial months ahead. If the farmers had a sincere friend in Mr. Harding they should have an equally sympathetic one in Mr. Coolidge who comes from a long line of Vermont farmers and was actually engaged in helping get in the hay when the call came.

Industry as well may enjoy the assurance that its interests will not suffer at the new President's hands. His words to the Senate of Massachusetts have been widely quoted and show his fearless purpose to act rightly as his conscience dictates. That he cannot be bluffed or coerced by the radical type of labor leader was shown conclusively in the Boston police strike.

Photographs of Mr. Coolidge taken during the past fortnight show his sadness at the loss of his friend and chief. His face also bears a look of realization of the heavy responsibility thrust upon him that is almost grim. And well it may be when he considers what the terrible strain placed upon its chief executive by the United States has done to his predecessors. Harding is dead, Roosevelt is dead, Wilson is an invalid and only Taft, whose four years were relatively uneventful, remains unscathed. Perhaps, after all, we could learn something from our friends in England who have found it wise to separate the social and business functions of the administrative office.

The English Market for Machinery

THE CALAMITY howlers who take delight in comparing the current business situation with that of 1920 and predicting equally dire developments overlook, among other things, conditions in Europe. Three years ago such countries of Europe as were not scraping bottom financially were going downward rapidly. Today some few have turned the corner and are on the way up. How far they will get depends, of course, upon their ability to steer clear of the various imminent political disturbances that are now threatening.

England, in particular, is staging a recovery that is the admiration of American business men who have recently returned from abroad. Even our own London correspondent, whose rose-colored spectacles have been lost for years, begins to see signs of improvement in certain lines.

The English machinery builders have gone hungry for so long that there seems to be little opportunity for American makers of tools that compete on even terms as to quality, capacity and price with the English ones. When it comes to tools of a type somewhat different from anything that can be obtained from English makers the chances are much improved. One American builder reports two recent sales of heavy grinding machines to English customers and a most encouraging increase in inquiries from that quarter after a long and disheartening silence.

One swallow does not make a summer, nor does one machine tool sale indicate a boom market, but in this case the return of interest in a direction where nothing has been happening for months is at least encouraging.

Selling Production Not Machines

ONE OF THE most successful salesmen in the machine-tool line informs us that he has given up arguing over the prices of the machines he sells. His customers are large producers, mostly in the automotive field, and they understand production costs better than many. And he has educated them to think of the "cost per piece" of the work done, rather than the first cost of the machine. They graduated from the "price-per-pound" stage long ago.

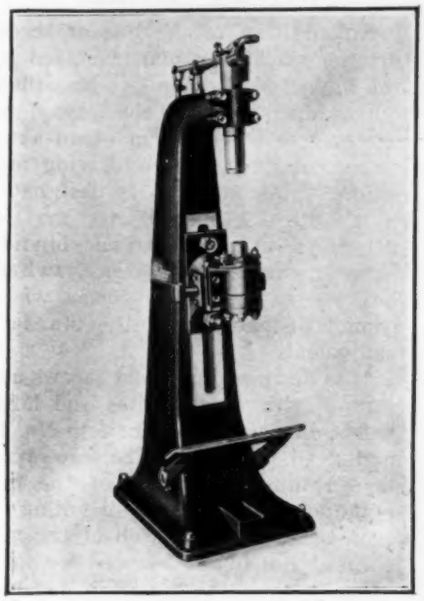
The men who select machines for these big production plants have learned that first costs mean but little. The demand for lower and lower production costs makes it necessary for machine-tool builders to develop newer and better machines. This development work has to be paid for by the customer as in all other lines of business. And, unlike the automobiles which these machines produce, this development cost must be distributed over comparatively few machines.

The sooner machine-tool builders and salesmen get this idea firmly fixed in their own minds, and instill it into the minds of users of their machines, the better for all concerned. For in too many cases, the builders themselves are at fault in not appreciating the fact that it is generally the users of their machines who make the most money.

Shop Equipment News

Findlay Pneumatic Riveting Hammer

A pneumatic riveting hammer has recently been placed on the market by the Findlay Engineering & Manufacturing Co., Findlay, Ohio. The machine is self-contained and operated by air alone without other power. For this reason it can be placed anywhere convenient to the work and simply connected to the air line.



FINDLAY PNEUMATIC RIVETING HAMMER

The frame is a semi-steel casting with a box section and the base has a considerable spread to insure stability. A treadle, pivoted on the frame, starts the hammer and operates the valve of the air cylinder which raises the anvil or dolly-bar. The hammer cylinder is clamped in the projecting arm of the frame and the anvil cylinder is attached to a bracket which is adjustable vertically on guides on the frame.

In operation the anvil moves up under uniform air pressure until the rivet is driven home. The pressure on the anvil is regulated by the amount the treadle is depressed. It is said that the machine not only makes the rivet head but also upsets the body of the rivet and fills the hole. The piston and anvil are made from chrome vanadium steel, heat treated.

The hammer is made in two models. The larger machine will drive 1-in. hot rivets or ⅞-in. cold rivets at the center of a 20-in. piece. This machine requires a floor space 18x28 in., is 62 in. high and weighs 648 lb. net. The smaller machine is designed to drive ⅞-in. hot rivets or ¾-in. cold rivets at the center of a 16-in. piece. It requires a floor space 15x20 in., the height is 57 in. and the net weight 555 lb. Both machines require air pressure at from 80 to 100 lb. per square inch.

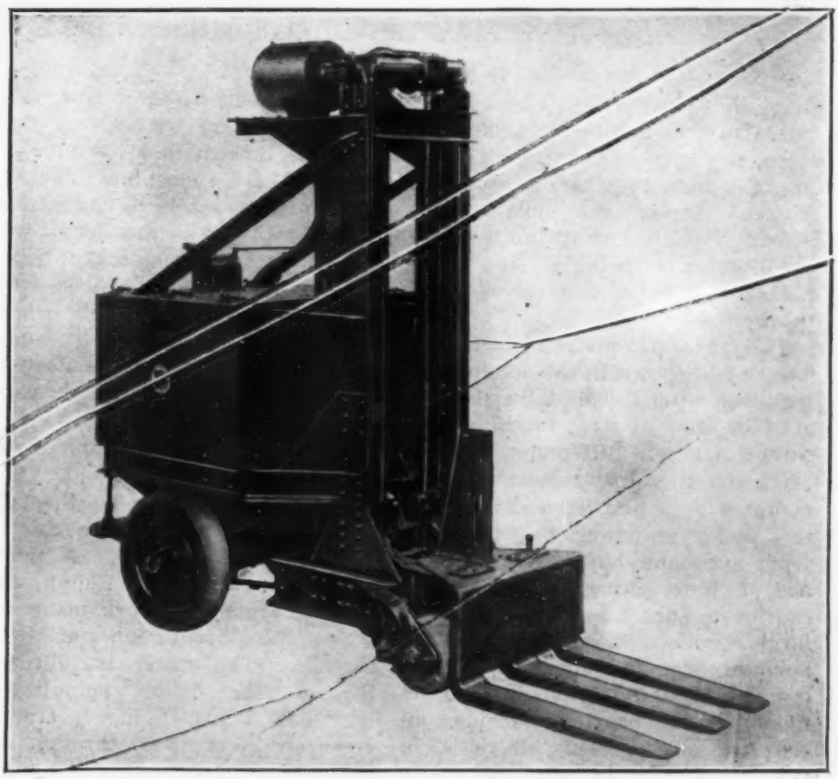
Lakewood Modified "Tier-Lift" Truck

The Lakewood Engineering Co., Cleveland, Ohio, has just placed on the market an elevating truck which is a modification of its orginal "Tier-Lift" truck. One of the leading design features of this machine is its ability to pick up its load without the use of platform skids. This feature makes possible the tiering or stacking of units without the usual waste space which is incident to the tiering of loads on platform skids.

The driving and lifting mechanism of the truck is the same as that on the former machine. The lifting motor is mounted horizontally on the top of the frame and drives the lifting screws through suitable reduction gearing. The frame is constructed of heavy structural steel and the lifting forks are forged steel.

The lifting forks shown on the truck illustrated were designed especially for handling sheet tin which is placed on 2 x 2-in. strips to be picked up by the truck. Other types of forks can be furnished for handling other commodities or packages.

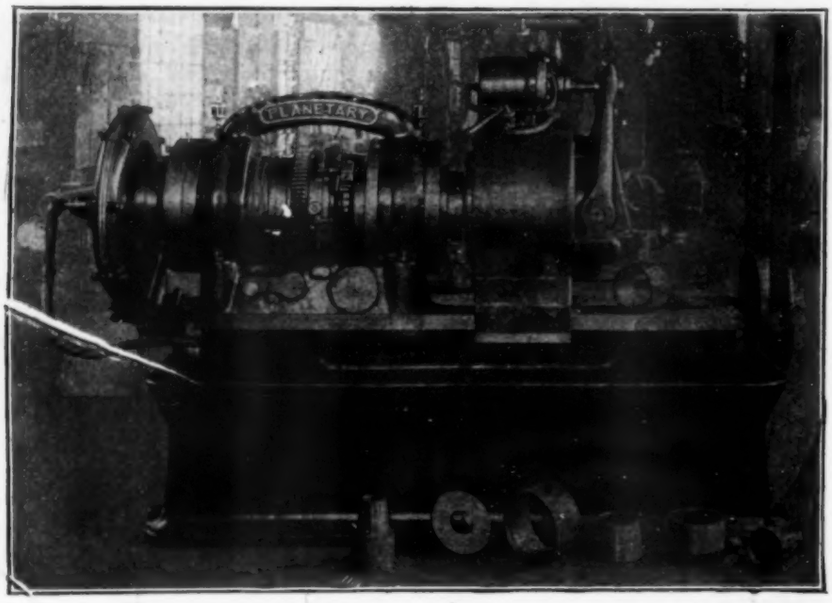
The load capacity of the truck is approximately 2,000 lb. and various maximum lifting heights are available. The wheels are rubber-tired and the driving mechanism and control mechanism are the same as those furnished with the previous design.



LAKEWOOD MODIFIED "TIER-LIFT" TRUCK

Hall Planetary Thread Milling Machine

A series of planetary thread milling machines has recently been brought out by the Hall Planetary Thread Milling Machine Co., Inc., Bridesburg, Philadelphia, Pa. In these machines the piece upon which the thread is being cut remains stationary, the rotating cutter revolving in an orbit about the center of the piece. For milling outside threads, the cutter is annular in shape, has the cutting teeth on its inside surface similar to a die, and completely surrounds the work. The internal thread cutter rotates and revolves inside the hole to be threaded. Cutters with no lead are used, the cutter being given a longitudinal motion as it revolves about the work.



HALL PLANETARY THREAD MILLING MACHINE

The general construction of the machine is shown in the accompanying illustration. The drive shaft is at the rear of the machine and carries a single belt pulley for belt driving. A 5-hp. motor may be mounted on a bracket and belted to this pulley or power may be taken from a countershaft. At the head end of the machine the drive shaft carries a sprocket which drives a large sprocket, keyed to the cutter spindle, through a silent chain. The cutter spindle is hollow and is mounted in bearings inside an eccentric sleeve. This sleeve is, in turn, mounted in another sleeve which rotates in the frame bearings. The amount that the cutter is thrown off center is determined by the angular relation of the two sleeves which is easily adjustable. For planetary revolution of the cutter the outer sleeve is driven by a worm and worm wheel, the worm receiving its motion through reduction gearing from the drive shaft. The worm wheel will be noticed on the sleeve between the two head bearings in the illustration. Motion is transmitted to the sleeves, which rotate together, through a clutch which is thrown in by a handle at the front of the machine. The revolution of the cutter then takes place until the thread is completed, when the clutch is automatically tripped and another clutch engaged which returns the sleeves to their original position automatically. A little more than one revolution of the sleeves is required to complete the threading operation.

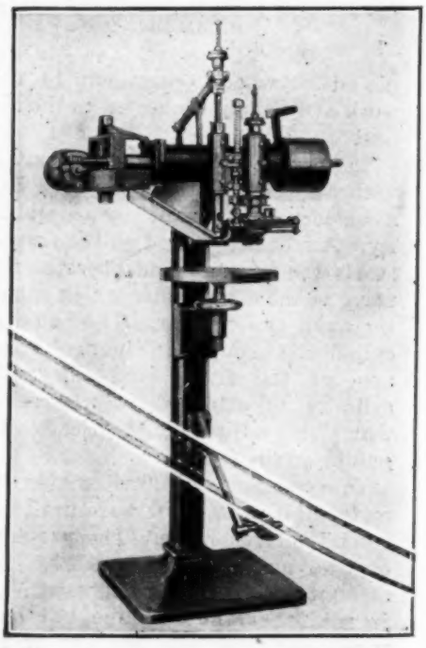
The sleeves and the spindle are fed longitudinally by a large threaded master ring on the outer sleeve which engages a master nut attached to the frame. A device, which feeds the cutter radially as it revolves around the work, makes possible the production of taper threads. The cutter is lubricated through the hollow spindle, the lubricant being pumped from a reservoir in the base through suitable piping to the end of the spindle and to the cutter.

The work is held in an air-operated chuck of the push-in collet type. The chuck is positioned for the work in hand and then bolted to the bed. The planetary action of the cutter gives the cutting edge a long sweep through the work and a good finish, it is stated, is the result of this action. The machine is built for production purposes on automobile parts and similar pieces. The bearings are ring-oiled. The machine shown in the illustration weighs about 13,000 pounds. Other sizes of the machine are also manufactured.

Reynolds Automatic Screw Driving Machine

An addition to the line of screw driving machinery manufactured by the Reynolds Machine Co., Massillon, Ohio, has recently been placed on the market in the form of an automatic hopper-fed screw driving machine. This machine is designated as the "No. 1 Special" and may be fitted to drive electrical binding screws, washer-head screws, switch-box screws and other forms which cannot be handled by the standard equipment.

It is designed for short screws and screws with short bodies and large heads, in sizes from No. 4 to No. 10 and up to ½ in. long. The screws are loaded into the hopper of the machine and no further handling is required. The operation of the machine is simple and adapted for operation by relatively unskilled labor.



REYNOLDS AUTOMATIC SCREW DRIVING MACHINE

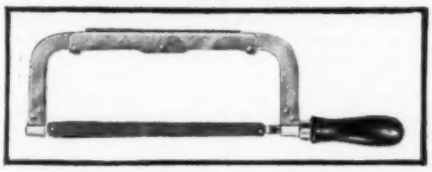
A 12-in. round or 14 x 24-in. rectangular table is furnished and the machine will drive screws at the center of a 14-in. circle. Screws may be driven tight or loose as required.

The spindle speed is 800 r.p.m. and the pulley speed 400 r.p.m. The table has a vertical adjustment of 2 in. without moving the bracket on the column. The size of the base is 18 x 20 in. and the height of the machine is 5 ft. 6 inches.

Consolidated No. 26 Hacksaw Frame

A heavy handle-adjustment hacksaw frame has recently been added to the line of such equipment manufactured by the Consolidated Tool Works, Inc., 296 Broadway, New York, N. Y.

The frame is made of ⅞ x 1¼-in. stock to insure strength and rigidity. The depth of the frame is 3¼ in.



CONSOLIDATED NO. 26 HACKSAW FRAME

and the length is adjustable for blades from 8 to 12 in. in length. The design is such that all the parts are held together when the blade is not in place. The blade is tightened by turning the handle and may be faced in four directions. The metal parts are nickeled and buffed and the handle black enameled.

Wallace Bench Solder Pot

An electrically heated bench solder pot with automatic heat control has recently been placed on the market by J. D. Wallace & Co., 1401 W. Jackson Blvd., Chicago, Ill. The automatic heat control is the same as that used on the bench glue pot manufactured by this company and described on page 428, Vol. 57, of the *American Machinist*.

In the solder pot shown in the accompanying illustration, the heating element is built below and around the container to insure an even distribution of heat at the side as well as at the bottom, since babbitt, white metal and wax circulate very sluggishly and require uniform heating throughout. The placing of the heating element in this way also decreases the time necessary to heat the metal. It is stated that 15 lb. of babbitt can be raised to a temperature of 600 deg. in 20 min. The

WALLACE BENCH SOLDER POT

material is always kept at the proper working temperature by the automatic heat control without further attention from the workmen, and the danger of overheating, with its attendant difficulties of oxidation and loss of material and tensile strength, is overcome.

The solder capacity of the pot is 15 lb. and the temperature is held at 600 deg. The heating element requires 900 watts, and the standard elements are furnished for voltages of 110 or 220 volts. Elements for other voltages can be supplied if desired. The pots arranged for direct current can be used with alternating current but the reverse is not true. The net weight of the pot is 13 pounds.

First Half of Year in Electrical Exports

Exports of electrical apparatus and supplies from the United States during the first six months of 1923 were valued at $34,514,924, which represents an increase of $2,694,412 over the corresponding period of 1922, according to preliminary figures announced by the electrical division of the Department of Commerce. The increase is attributed mainly to increased business in small plants and supply lines rather than in heavy power equipment. The provision gives the following summary of exports for the semi-annual period:

The total value of generating apparatus exported, including both a. c. and d. c. equipment, was $2,025,171 during the first six months of 1923, a 6.8 per cent increase over the same period of 1922. Shipments of mechanical drive turbines taken alone, however, were less this year than during the half of 1922.

Export shipments of self-contained lighting plants during the first half of 1923 were nearly double in value those of the same period of 1922. Over 1,200 lighting sets were shipped between January and July of this year.

Dry battery exports increased about 36 per cent in number and 15 per cent in value during the period in question in comparison with 1922. Storage battery shipments also showed a heavy increase, $1,224,572 worth being the amount exported during the first half of 1923, while the total was only $653,539 for the same period of 1922.

Shipments of transformers, converters, switchboards, circuit breakers and lightning arresters, aggregated $4,384,619 in value during the first half of 1923. This is somewhat less than the exports during the same period of the previous year, which were swelled by large individual shipments of power plant equipment.

Meter Exports

The total for all kinds of meters shipped abroad between January and July, 1923, amounted in value to $686,109, also a decrease over the previous year.

Fractional horsepower motors gained largely over 1922, a total of 68,332 motors valued at $981,533 having been exported during the first six months of the year. Shipments of other kinds of motors, however, fell off during the first half of 1923. Thirty-four electric railroad locomotives, valued at $1,926,990, were sent to foreign markets. In the same period of 1922 there were only two such locomotives shipped, valued at $22,361.

Electric Fan Sales

The value of electric fans exported during the January-June period in 1923 was $513,867 as against $497,055 during 1922. It is interesting to note that the number of fans shipped was 6,793 less than the total for 1922.

Shipments of metal filament lamps decreased in value, although a larger number were exported during the half of 1923 than during 1922. A total of 118,955 motor driven household devices went abroad during the first half of 1923, these being valued at $453,254. This is an increase of 57 per cent over the same period of 1922. An even larger increase took place in the case of domestic heating and cooking appliances, the total for the first half of this year being valued at $474,546. This is almost 80 per cent above the 1922 period.

Radio apparatus shipments varied widely from month to month during 1922. A much wider distribution is shown this year by the manner in which the quantity of exports maintained a steady high level. During the first six months of 1923 the shipments were valued at $1,209,389.

Fixtures and Wiring

Exports of house wiring supplies and fixtures made a 207 per cent increase during the first half of 1923 over the total for the same period of 1922. This is in line with the same tendency shown in the case of motor driven household devices and domestic heating and cooking apparatus, indicating the great development which is taking place in our foreign sales of these lines.

The electrical export business of the first half of this year has made a most creditable showing and it is safe to say that a steady if not rapid increase is taking place in the demands of foreign countries for American electrical goods, convenience of design, sturdiness in construction and many other features of American products have aided in building up this business.

News Section

Railroad Report Shows Fine Condition

The Class 1 railroads of the country earned during June a return of 5.47 per cent on their minimum tentative valuation as fixed by the Interstate Commerce Commission. This rate is lower than in May, when the earning return was 6.33 per cent. The falling off was due principally to a decrease in earnings of the Western railroads, the Eastern group having again earned above the 6 per cent figure. The report by groups showed a return of 6.39 per cent for the Eastern roads, against 4.20 per cent for the Western group.

With the June figures in, the Bureau of Railway Economics and the Car Service Division of the American Railway Association were able to report on railroad operation for the first half of this year. These figures show a return for the period at the annual rate of 5.64 per cent, which is only .11 per cent below the return set by the Interstate Commerce Commissioin as "fair."

This is the best half year that the railroads have experienced since before the war, and the showing was regarded by railroad men as particularly impressive in view of troubles growing out of strikes by shopmen and coal miners last year, and the consequent impairment of equipment. In addition, the Western and Eastern roads encountered severe weather conditions during the first three months of this year.

For June the report shows an aggregate of net earnings for 194 roads having a mileage of 235,400 miles, amounting to $87,742,000, against $76,271,000 in June, 1922. Thirty-one Class 1 railroads in June operated at a loss. Nine of these roads were in the East, two in the South and twenty in the West.

For the first six months the net operating income of the Class 1 roads is cited as $443,912,000, against $349,069,000 for the same period a year ago.

From Sept. 1, 1920, when the roads were returned to private operation, the average annual return to and including the June figures of this year has been 3.94 per cent, according to the report. For the Eastern district the return has been 4.02 per cent, the Southern, 4.05 per cent and the Western, 3.82 per cent.

Tornado Wrecks Three New England Plants

A tornado that cut through the industrial district of West Springfield, Mass., on Sunday afternoon, Aug. 5, caused many thousand dollars' damage to several plants. The Gilbert & Barker Mfg. Co. suffered a loss of nearly $10,000, its locomotive shed being virtually ruined, and much damage done in the twisting of window frames and the breaking of glass. Piles of wreckage were deposited on the roofs of the company's buildings, the remnants of nearby properties.

At the plant of the Wico Electric Co. a 100-ft. chimney was demolished, and the wreckage crashed through the roof of the assembly room resulting in much damage to machinery and loss of materials. This company estimates its loss at $25,000 and its production is set back somewhat. The C. H. Smith Corp., makers of fine wire specialties, suffered damage to machinery and part of the roof was torn away, as well as the rear end of the main building. No lives were lost, owing to the storm breaking when the plants were inactive.

Plenty of Employment in St. Louis

Shops in St. Louis with few exceptions continue to run on a full time schedule. There has been a little falling off in the past two weeks in new orders, but the number of inquiries received seems to indicate that Fall business will be good.

The automotive industry has slowed down a little and in one shop that manufactures automobile machinery a cut in the working force has been made.

Construction in the oil fields of the Southwest has been resumed and should in a short time re-act in favor of the machine tool trade.

Railroads are still very conservative in their buying, but some members of the machine tool trade think that it will be only a short time until they are much more active in the market. This conclusion is based on the obvious necessities of the railroads to properly equip their shops and from their purchases of other equipment.

Woodworking machinery is finding a fairly good market. Shops engaged in the manufacture of this product are working full time and are very optimistic as to the outlook.

There has been quite a little labor trouble in this vicinity lately which, while it has not hit the machine tool industry directly, has stopped or slowed up the construction of many jobs and threatens to spread further. The supply of labor for shops is adequate, although—as is always the case—skilled mechanics are needed for some work. No concern, however, is handicapped through its inability to get such men.

The Federal Reserve Bank report for July for the St. Louis District states that "during the month of July there was heavy production and shipments of iron and steel products, but a halting condition of new business. Reductions in prices of certain lines caused uncertainty in the buyers' minds and resulted in the postponement of orders for the purpose of filling future needs."

Collections are backward and money is hard to obtain. Therefore some hesitancy is noticed in credit departments and every effort is being made to keep accounts up to date.

Machine tool builders are confident as to the future and are looking forward to an early Fall return of business this year.

Decrease in U. S. Steel Unfilled Orders

The United States Steel Corp. recentely reported a reduction of 475,498 tons in the amount of forward business on its books as of July 31, 1923. This reduction was about as expected in the Wall St. district as estimates recently called for a decrease of from 400,000 to 500,000 tons. The reduction reported yesterday makes a total of 5,910,763 tons carried on the books of the corporation at the close of last month, the smallest total reported in exactly a year. It compares with a total of 6,386,261 tons at the close of June and with 7,403,332 tons at the close of March, the record total for the current year to date.

The reduction had virtually no effect on the market action of the company's shares yesterday. This was due, in part, to recent official statements issued by executives of the company that new orders during the last few weeks were sufficient to cover shipments and that if this continued the plants of the company were assured of near capacity operations "for a long time to come." The company's plants are now operating at slightly better than 90 per cent of capacity. It is calculated that on this basis the company has sufficient orders to keep its plants active until Jan. 1, 1924, even though no new business is taken between now and the close of the year, which is not likely, of course, to be the case.

Youngstown Sheet & Tube Shows Good Profits

The Youngstown Sheet & Tube Co. for the six months ended June 30 reports gross income of $18,888,335. These figures include the operations of the Steel & Tube Co. of America and the Brier Hill Steel Co. which were merged with the Youngstown company some time ago.

After allowing for depreciation and depletion charges, there was reported net income of $14,883,310. Net profits available for the capital stock for the period aggregated $12,912,553, and the surplus after dividends was $9,600,114.

Automotive Industry Has Record July Output

The National Automobile Chamber of Commerce reports 318,000 motor cars and trucks produced in the United States during July. This total represents a drop of 10 per cent from the June total, but is the largest reported for any July in the history of the industry. Compared with July, 1922, a gain of 29 per cent is reported. From Jan. 1, to July 31, 1923, there were produced 2,343,000 cars and trucks in the country, while the total for the twelve months ended July 31, 1923, aggregated 3,525,000 cars and trucks.

Many Inquiries for Tools in Pittsburgh

With all the branches of the iron and steel industry very quiet these days on account of the seasonal letdown and the shortage of labor, the same condition practically is encountered in the field of machinery and machine tools. The equipment market has been quiet for several weeks past, and in the past two or three weeks has just about reached the low ebb, without, however, discouraging the dealers in machine tools or machine equipment in general. Industrial conditions are such that there is sure to be a natural rebound back to activity along all lines, including structural and all building lines, which always means orders and inquiries for tools of every description.

The Pennsylvania R.R. put out large lists for bids some time ago, and many responses have been received for requirements of the railroad shop at Youngwood, Derry, Pitcairn and Sharpsburg. It is said that the needs of the yards at Conway, Pa. and the shops at Columbus, O., which had been expected to give an impetus to the machine tool trade, will not be satisfied at this time, but will have to be attended to later, as machinery and tools are needed badly at these two places, and dealers are looking for some fine orders in the near future.

The Baltimore & Ohio R.R. came out some time ago with requests for bids against a list of nearly two dozen items for the shops at Glenwood, a suburb of Pittsburgh. Inquiries and sales in the past two weeks have been confined to single items with one exception, that of a customer in the northern part of the state who bought four lathes.

Among other sales noted were those of two or three lathes to as many customers, as well as two drilling machines for out of town. A new shop has been started at Neville Island, formerly government property in the Ohio river, by the Dravo Construction Co., and machinery equipment dealers are keeping close tab on its needs, as the company will need structural shapeworking machinery in the near future. There are sales of used machinery every other day or so, but in general they are single installations. It is said that the business in both new and used machinery for the month of July in the Pittsburgh district will measure up very favorably with that of the same month in any previous year.

Buffalo Manufacturers Spend Busy Summer

Although not by any means swamped with business, Buffalo manufacturers of machinery such as punches, shears and bar cutters report that they have had a steady flow of orders during the past couple of months and are quite well satisfied with conditions. Although orders have been coming in steadily they generally run smaller in volume than during the period from January to June of this year and this has made it possible for some of the manufacturers who had been behind for some time to catch up on their work.

Another thing that has enabled manufacturers of this type to catch up has been that there are more men available, both skilled and unskilled labor. Many are coming here from out of town and a few local concerns manufacturing other lines have let out small numbers of men since July 1. The Buffalo Forge Co. reports that for the first time in two years it has been able to get all the men needed. Laborers for foundry work have been especially hard to get in the past, but now the market seems to be well supplied.

Just now, in heavy equipment, the railroads seem to be the largest buyers, several of them coming in the market recently for shears, punches, bar cutters and some other types of smaller machinery. One recent contract to a Western railroad ran to $50,000 and this, while comparatively small, is considered good for this time of the year with general conditions as they are.

Milwaukee Experiences an Improvement

Enough new business has been booked by machinery manufacturers in Milwaukee during the first half of August to confirm expectations that there would be a substantial recovery from the midsummer dullness felt during the latter part of June and throughout July. The course of business remains uneven and has not assumed respectable volume as yet, but a slowly broadening tendency is noticeable as Fall approaches.

Metal trades shops are putting out fair inquiry, the most impressive feature of this being that it embraces no large lots. Inquiry is not general, but more sources are coming forth with requests for quotations and delivery dates. Manufacturers of prime movers, hydroelectric and steam generating machinery, pumps, oil well equipment and railroad materials are the most active at present. Automobile shops are doing a little buying, but their activity is less pronounced than earlier in the year, so far as purchasing is concerned. Inquiry from this source is increasing and the machine tool trade expects fair buying in September and the months following.

Employment in industry in Milwaukee reached its peak during the first week in July and sustained the figure past the first week of August. Fifty typical industries employed 35,776 on July 2, and the same employers reported a total of 35,740 on Aug. 2, a reduction of 36 which is not considered significant.

Excessive turnover of labor, especially in the metal trades shops of Milwaukee, has been reduced slightly but is still uncomfortable. For the first six months turnover was at an annual rate of 200 per cent, which is dangerously close to the figure of 211 per cent reported for 1920. In June it was 17 per cent, but for July a decrease to 15 per cent was reported, and conditions in August, so far as determinable, indicate a slight further decline.

Letdown in building construction, principally housing, has released a large quantity of common labor, but this is not yet felt in relief of industrials, as the men as a rule are content to remain without jobs until financial conditions compel re-entrance upon employment or weather conditions are more suitable for labor.

The call for skilled labor is not as heavy as it was up to a month to six weeks ago, but a shortage still exists because there is no increase in the supply.

Improvement Holds in New York Market

The improvement noted in the report of business in the New York district last week has continued into this week and dealers feel that while there is no apparent cause for this unexpected turn, there is no reason for an abatement. This week's reports were equally as cheerful. As one dealer pointed out, many of the transactions were the culmination of weeks of work by the salesmen, but even considering this, it showed a willingness on the part of the manufacture to conclude the deal and also a confidence in present times.

While the death of President Harding has had its depressing influence on the machine tool trade in the Metropolitan district and the loss is keenly felt, all dealers joined in expressing the opinion that in President Coolidge the country has a sound leader and one who will ably guide the ship of state away from the shoals of business depression in an equally calm and efficient manner as the one that President Harding had pursued.

Dealers in used machinery reported an improvement in business this week and they, like the dealers in new machinery, are at a loss to explain the sudden upward turn of affairs.

Inquiries from railroads are still coming in in good volume and purchasing is going on with about the same amount of activity as during the past two months. Preparations for exceptional Fall buying on the part of the automotive industries are being made by most dealers and it is anticipated that a heavy Fall business will be consummated.

General industrials are buying single machines from time to time and the textile industry is still in the market, though feebly.

Skilled Labor in Demand in Chicago

July machinery sales in the Chicago district were considerably less than any previous month this year. Industrial buying continues to be very slow and the railroad business which kept up the volume of sales during previous months has apparently spent itself.

The automobile industry has not made purchases of machine tools to the extent that the heavy production in that industry would lead one to expect. However, announcement that the General Motors Corp., Oldsmobile Division, will spend several million dollars for new machinery, equipment, and additions to the present plant at Lansing, Mich., brings promise of further activity in that line. Automobile production apparently will not materially slow up in the near future and several large manufacturers report production of automobiles during July in excess of all previous records for July. The automobile industry may do sufficient buying of machinery to compensate the machinery market for the loss of railroad buying.

The Pennsylvania R.R. continues to make small purchases for various shops, the Chicago & North Western R.R. is also buying and the Santa Fe and the Union Pacific placed a few more orders this week. The Illinois Central R.R. issued a list for five tools.

Common labor is plentiful, although specialists and skilled workers are in demand.

Personals

FRANK PURNELL and W. C. REILLY were named vice-presidents of the Youngstown Sheet & Tube Co., Youngstown, Ohio, and WALTER E. WATSON was named general manager of sales at a meeting recently of that company's board of directors.

ELMER T. MCCLEARY was named manager of the new and enlarged Youngstown district of the Youngstown Sheet & Tube Co., C. M. LINGLE, manager of all of the company's properties and F. H. GORDON, general manager of the Zanesville property.

J. ELMER FRANTZ and RAYMOND FRANTZ of the Landis Tool Co., Waynesboro, Pa., sailed Aug. 4 on the S.S. "America" for a trip to Europe. They will land at Bremen and tour the continent and England.

COL. THALES L. AMES, who has been transferred from the post of commandant of the U. S. Armory at Springfield, Mass., to Governor's Island, to have charge of the Ordnance Corps of the Second Corps Area, left Springfield Aug. 8, and is succeeded at Springfield by MAJ. EARL MCFARLAND, who for some time had been in charge of manufacturing at the Armory. Col. Ames was chief ordnance officer at Tours, France, in the World War. He had been stationed at Springfield since April, 1920.

J. W. SPENSLEY, for a number of years Eastern representative of the Champion Crane & Engineering Co., Kent, Ohio, with offices in New York, has resigned to devote more time to the sale of industrial and domestic oil burners for the Brooklyn Oil Burner Co., Brooklyn. He was associated with the crane industry for more than 25 years, being early affiliated with the American Hoist & Derrick Co., St. Paul.

A. E. QUERE has resigned as assistant general manager of sales for the Ashtabula Steel Co., Ashtabula, Ohio, to accept a position with the Cleveland Steel Co., Cleveland. He formerly was connected with the Niles Steel Products Co., Niles, Ohio, and the Brier Hill Steel Co., Youngstown, Ohio.

H. M. BOWMAN, who for several years was advertising manager of the Betts Machine Co., Rochester, N. Y., has been appointed advertising manager of the Consolidated Machine Tool Corp., New York, with headquarters at the Betts plant in Rochester. He will be assisted by F. T. Van Syckel, who has been in the New York office.

W. R. BARNETT, superintendent of the Zanesville, Ohio, branch of the American Rolling Mills Co., has resigned his position. He has been associated with the plant for the past twenty years.

WILLIAM B. MCSKIMMON, vice-president and general manager of the Union Twist Drill Co., Athol, Mass., sailed Aug. 8 on a two months' business trip to Europe.

CHRIST. WALTER has been elected president of the Wisconsin Automotive Corp., of Menasha, Wis., which is the new title of the former U. S. Tractor & Machinery Co. assumed recently following the decision to manufacture passenger automobiles and power farm equipment in addition to tractors and gas engines. Mr. Walter has been vice-president for two years and will now give the enterprise his entire time. G. D. Harris continues as vice-president and general manager. Joseph G. Sailer is secretary, and Dr. A. B. Jensen, treasurer.

WILLIAM J. WOODRIDGE has been appointed manager of the electrical sheet department of the Mansfield Sheet & Tinplate Co., Mansfield, Ohio. Prior to his appointment he was connected in the same capacity with the Whitaker-Glessner Co., Portsmouth, Ohio, resigning there in May. For more than 25 years he was electrical engineer with the General Electric Co., Schenectady, N. Y., during which time he specialized on electrical sheet problems.

CHARLES C. GIBSON, for many years vice-president and secretary of the Mullins Body Corp., Salem, Ohio, has been elected president to succeed W. H. MULLINS, who is resigning as active head of the company. It is also announced that FREDERICK P. MULLINS will succeed the new president as vice-president.

R. J. MCNAMARA of McNamara Brothers Co., Baltimore, Md., and others have formed the Atlas All-Steel Truck Body Co. for the purpose of manufacturing steel bodies for automobile trucks. The company plans to make about a hundred bodies a week.

JULIUS J. GOETZ, 349 Broadway, Milwaukee, has been appointed receiver of the Christensen Engineering Co., 1813 Fond du Lac Ave., Milwaukee, manufacturing pneumatic machinery and automobile devices, by the Circuit Court for Milwaukee County. The action was taken on petition of C. Adelbert Goodrich. The receiver is now receiving sealed bids until Aug. 18 for all machinery, tools, equipment, raw material, etc.

WILLIAM E. DUNN, JR., secretary of the Southern Metal Trades Association, will represent the industries of the South in the European tour of the American Foundrymen's Association and at the International Congress of Foundrymen at Paris. Upon his return to this country Mr. Dunn will visit the industries in the North and East before returning to the South.

P. B. TUSSING, formerly assistant traffic manager of the Weirton Steel Co., Weirton, W. Va., has been appointed traffic manager of the Imperial Coal Corp. at Johnstown, Pa.

C. A. MCCOLLOUGH is now the chief engineer of the Pittsburgh Bridge & Iron Works Co., Pittsburgh, succeeding the late L. F. W. HILDNER.

Obituary

WILLARD PENNOCK, president of the Minerva Steel Foundry Co., Minerva, Ohio, died recently at his home in that city. He was nationally known as an inventor and architect. He drafted the plans for the first steel railroad car in 1892 which was manufactured by the Pittsburg Steel Car Co. of Pittsburg, Pa. He also was interested in several Canton, Ohio, steel industries and formerly was owner of the Minerva Manufacturing Co.

EDWARD M. WOODWARD, president and treasurer of Woodward & Powell Planer Co. and an ex-president of the National Machine Tool Builders' Association, died recently. A complete obituary will appear in next week's issue.

WILLIS F. MCCOOK, president of the Pittsburgh Steel Co., Pittsburgh, Pa., died recently in a hospital in that city.

HARVEY H. BROWN, aged 75 years, died recently at his home in Cleveland following a year's illness. Mr. Brown was a partner in Harvey H. Brown & Co., iron ore dealers, president of the Stewart Furnace Co., Sharon, Pa., and chairman of the board of directors of the Brown Hoisting Machinery Co., Cleveland.

EDWARD T. CADLE, former president and general manager of the Globe Iron Works at Sacramento and Stockton, Calif., died in Sacramento recently.

THOMAS B. CONROY, aged 62 years, died at his home in Chicago recently. He was president of the Conroy Boiler & Tank Co., and was a member of the Illinois Athletic Club, Beverly Hills Country Club and the Elks.

Business Items

The new assembly building of the Dodge Brothers' Motor Car Co., Detroit, is nearing completion. The building is six stories high, 1,000 ft. long and 75 ft. wide. Other units of the 1923 expansion program of the officials is the new cynide building, now under construction. This is a million dollar addition to which will be added an immense power house. The total cost of the additions will be approximately $5,000,000. New equipment for the building of closed bodies, and machinery for the power house will be purchased.

An application for incorporation of the Central Furnace Co. of Massillon, Ohio, which will be organized in connection with plans of the Central Steel Co. to erect a blast furnace and auxiliary plants near its present mills has been filed at Columbus, Ohio, according to announcement by the Central Steel Co. officials. The new company is to be incorporated for 100,000 shares of no-par stock. Incorporators of the new company are R. E. Bebb, F. J. Griffiths, C. E. Stuart, B. F. Fairless, J. M. Schlendorf and C. G. Herbruck.

Extensive alterations are being made to the plant of the Ohio Nut & Bolt Co., Berea, Ohio. The company announces that considerable of its old hand operated machinery is being scrapped and modern automatic equipment installed.

The Machinery Supply & Equipment Co., Milwaukee, has been chartered in Wisconsin to buy, sell, deal in, repair and manufacture saws, knives, bits, cutters, etc. The incorporators are E. V. Mallay, H. E. Vedned and Harold W. Connell, attorney, 68 Wisconsin St.

The Elliott & Stephens Machinery Co., St. Louis, Mo., has been appointed exclusive distributor for the Lodge & Shipley Machine Tool Co. in the Southwest.

The Motor Tool Specialty Co. has opened a salesroom at 613 North Illinois St., Indianapolis.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

By THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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THE nation was not much concerned with business last week. The passage of the Harding train across the continent and the observance of the funeral services at Washington and Marion had a compelling hold on a sorrowing country's attention, and in mourning for the late President business houses and exchanges closed at suitable times throughout the country. Virtually only half a normal week's business was conducted.

But it was quickly apparent that the change of presidents would have no effect on the markets, particularly as Mr. Coolidge is making it clear that there will be no divergence from the conservative policies that Mr. Harding followed. Stocks have been firm and at times strong. Bonds have held steady and give promise of soon doing better. Grains were higher at the close of the week. In none of the speculative markets has there been any evidence of the kind of selling that would indicate widespread distrust of the future, and leaders among business men everywhere have been quick to express the view that President Coolidge deserves the country's complete confidence and support.

We must therefore look elsewhere for the facts and fancies which are influencing the course of prices and trade. Many of the principal commodity markets continue dull and the prophets of disaster are making the most of it, but there is nothing unusual about dullness in July and August and in all lines from cotton goods to hardware most of the merchants who admit they are doing little at present expect an active Fall trade.

The bases of some of the pessimistic outgivings are really amusing. One of the leading professional forecasters sounds a warning because he thinks "the attitude of the younger generation is distinctly harmful" and because people are spending too much, though the average business man's complaint is that they are spending too little and at present a revival of free buying is more desired than addition through saving to our huge credit reserves.

Then a great many people write me complaining because workingmen have too many automobiles, citing instances of a whole block of cars parked before a factory or something similar. It seems strange that this should be regarded as a sign of danger rather than a symbol of progress and prosperity. An automobile is a manufactured commodity, made up of raw materials in whose fabrication hundreds of thousands of men are employed, and the money paid for automobiles in the last analysis goes principally for the employment of labor in the basic industries of the country, just as it would if it were paid for clothing or some other commodity. Furthermore I was told recently by a prominent furniture manufacturer that he had found his workmen more efficient since they had enjoyed the greater leisure which the automobile provided.

In this and other ways "calamity howling" has created a series of popular misapprehensions which because they undermine confidence are just as unsettling as if they were well founded. Take, for example, the following statement made recently by a business prophet: "Earnest and industrious manual laborers, such as we had twenty-five years ago, are almost an unknown quantity. Everyone wants to ride in the cart and no one wants to pull."

As this gentleman's vantage point is high on the cart seat he perhaps should be able to see what he is talking about, but the fact that our production of goods has attained hitherto unheard of proportions only this year is sufficient refutation of the implication contained in his statement.

The country is "sent to the dogs" periodically, but somehow the wheels of trade keep on turning, and at present, despite some momentarily unfavorable phases of the outlook, American business is on a sound basis. There is no valid reason for pessimism, at least as long as our eyes are kept on this side of the water. The "hand to mouth" buying so frequently reported means simply that merchants are showing commendable caution against over-stocking, which is for the good of trade in the long run. Even so the physical volume of business as measured by car loadings and check transactions is enormous, and in conducting it our credit machinery does not give forth the slightest squeak.

Specifically, the steel industry reports a continuance of recent improvement. Building and automobile manufacturing, on which the Spring activity was largely based, have been surprisingly well maintained, though naturally they have declined considerably from the peak. It is quite possible that the bottom of inactivity in the cotton goods market has already been passed, as the renewed strength of raw cotton and the refusal of the mills to accumulate stocks decreases the expectation of further price cuts.

On the farm the prospect is certainly no worse. The Government Aug. 1 report showed a decrease of half a billion dollars in the potential farm value of the crops, but the total is still half a billion above last year and wheat and cotton were both higher than they were at the first of the month.

The stock market has shown greater powers of resistance and there is little doubt that many far-sighted investors are taking advantage of the buying opportunities afforded by the low levels of security prices.

There are, of course, unfavorable facts to record also. The over-production of petroleum, resulting from the almost criminally wasteful methods of its exploitation, continues and there seems little immediate chance of better times in the oil markets. The industries which are partly dependent on Europe, such as shipping and copper, are also lagging, and more or less dullness is reported in silk goods, leather and tires. And an anthracite strike is still threatened, although Washington dispatches seem confident that President Coolidge will find a way to avert it.

In Europe there have been few further developments and there is little more to report than was said in this article last week. The tension between Great Britain and France has not been lessened, but Belgium, which has hitherto supported France, seems to be shifting to the side of Great Britain because the decline of the Belgian and French francs has engendered profound alarm that unless a settlement is reached they will follow the German mark into oblivion. Because this possibility is daily becoming more probable I am inclined to think that a compromise will eventually be reached.

As to Germany, it is evident that the mark will be buried within a very short time and replaced in part by some new form of paper and in part by American and other foreign currencies. Nor is it probable that the world's business will suffer much more from the shock than it has in anticipation of it.

As one considers that Germany has kept on doing business in the face of what appear from here to be insurmountable difficulties, one wonders how anv American can be pessimistic.

Tremendous Gains Shown By Erie Railroad

Traffic on the Erie R.R. from the first of the year to date is heavier than ever before in the history of the railroad, according to T. C. Powell, vice-president. The tremendous gains the road has made over last year are due principally to the increase in the amount of anthracite coal traffic that is being handled over the line, but to make the high freight record for all time it was necessary for the road to show an increase on all commodities for the first seven months of this year.

The continued demand for anthracite coal and the promise of a 22 to 30 per cent increase in the amount of fruit business coming into New York this year, it is pointed out, indicates that the traffic will continue heavy over the Erie for the remainder of the year.

Improvements are being made by the road in order to adequately handle the anticipated business.

News of Washington Activities

By Paul Wooton

THE President cannot die without affecting all industries and most individuals. The lamentable death of Mr. Harding comes at the worst possible time insofar as it affects the coal situation. It is certain to have a very direct bearing on the questions of labor relations which are now in such an acute stage.

While those who are in a position best to appraise the situation are convinced that there will be no strike, they must admit that the situation is one in which a crisis might develop at any time. Government intervention is more likely now than ever before in peace time, due to the fact that the public is not inclined, after the experiences of the last few years, to be kept in suspense as to its fuel supply.

Enough has been learned in the last few years of Government intervention to make it very clear that it is a diplomatic rather than an executive undertaking. To undertake to mediate in such a situation as exists today in the anthracite region means the employment of diplomacy such as is implied by the better sense of the word—the use of sympathy and understanding. Such a task can be undertaken only by a person in whom each side has confidence. Whatever may be said about Mr. Harding's greatness as an executive, no single individual in the land will dispute that he was a man of friendship—a man with an intense desire to do the right thing. He commanded the respect of capital and labor alike because they knew he was big hearted and would do his best to be fair. On the other hand, the public would have been satisfied with his mediation.

People generally do not have an opportunity to go into the details of issues. They would have been willing to abide by his conclusions. The man so amply suited to undertake mediation has been suddenly removed. It is true that the country is to be spared the aimless drifting which marked the administration's policy just before and during the strike of 1919. At that time there was great uncertainty as to the extent of President Wilson's incapacity. No one was sure whether or not the pronouncements coming from the White House were those of the President or of someone else. Later it was established that some of these pronouncements, at least, did not come from the President himself.

What Will the President Do?

In the present situation, the uncertainty is of a different character. There naturally will be delay before the new helmsman will feel confident to take the ship of state into the main channel. The situation is complicated by lack of knowledge as to what the new President may do. The outstanding achievement of his career is his handling of a labor matter. His action at Boston in connection with the strike of policemen brought him into national prominence and secured for him the praise and support of those who believe a firm stand must be made against the exactions of labor unions. That act, however, antagonized labor. It is certain the United Mine Workers would hesitate a long time before they would agree to accept President Coolidge as final arbiter of questions which to them seem vital.

Coolidge and Labor

Unquestionably labor unions are not at all sure, but that one of the principal opponents of their policies has been elevated to the presidency. They must recognize that since Mr. Coolidge first came to national notice because of his stand against unionism, it would be only natural were he to be of the opinion that the public approves of such a policy. His experience in Boston may have convinced him that unionism must be curbed and that nothing can be gained by temporizing with it. In such a case he might conclude that the anthracite situation offers a splendid opportunity to put his views into effect.

On the other hand, many think Mr. Coolidge will take this opportunity to demonstrate that he is not opposed to labor unions when properly conducted. He may admit the right of the United Mine Workers to demand all that they have and to strike if they do not get what they ask. At best, however, it is admitted on all sides that the prospects of agreement is less auspicious today than it was yesterday.

The Real Issue

Many doubt that the check-off is the real objective of the United Mine Workers. The rank and file of that organization is so much more interested in wage than in any of the collateral issues, that it is not probable that the necessary support will be forthcoming to insist upon the check-off. The check-off means a great deal to those who are responsible for the financing of the international union, but it means much less to the member of a local. The heads of labor unions are like political leaders or the heads of European states in that they can go only so far in persuading their people to accept solutions which are distasteful to them.

Signs are multiplying that the anthracite workers are ready to insist on the increase. Apparently the more conservative leaders, like the heads of the international union, will have great difficulty in avoiding a suspension unless they can promise a wage increase.

During the last strike it was claimed at first that the anthracite workers were being held out to win for the bituminous workers, and that if they were left to themselves they would return to work. Exactly the reverse proved to be the case. It was nearly a month after the Cleveland agreement before work was resumed, and even then the terms of settlement were all but rejected when the ratification convention met in Wilkes-Barre. Steam roller tactics had to be employed to get ratification through and even then it carried by a small margin.

New factors have entered since then to bolster up the determination of anthracite workers. They elected Capellini. They not only elected him but they did it by a large majority. For a time after his election, Capellini seemed to have joined hands with the conservative leaders, but now that he has been accepted as a member of the negotiating committee, he has come out with a statement that he will not surrender any demand and that he will press each one of them.

With the death of the President and with unmistakable signs of increased determination on the part of the mine workers, the prevalent opinion in Washington is that the situation has taken on new seriousness. Industrialists are carefully watching Mr. Coolidge's every move.

Comparative Prices of Shop Supplies

Average of New York, Chicago and Cleveland Prices

	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb	$0.0337	$0.034	$0.0263
Cold finished shafting	per lb	0.0428	0.042	0.034
Brass rods	per lb	0.1825	0.1825	0.1650
Solder (½ and ½)	per lb	0.276	0.2862	0.221
Cotton waste	per lb	0.1231	0.1231	0.101
Washers, cast iron (⅛ in.)	per 100 lb.	4.66	4.66	3.83
Emery, disks, cloth, No. 1, 6 in. dia	per 100	3.08	3.08	3.11
Lard cutting oil	per gal	0.575	0.575	0.575
Machine oil	per gal	0.349	0.349	0.36
Belting, leather, medium	off list	37%	37%	46¾%
Machine bolts up to 1x30 in.	off list	44¼%	44¼%	59%

Carnegie Institute Has Metallurgy Course

As a result of the definite and increasing demand of the metallurgical and allied industries for college men, Carnegie Institute of Technology in Pittsburgh has recently established a group of new and special courses in metallurgy and allied subjects says an announcement. The courses, some of which are for one year, have been prepared to appeal both to graduates of liberal arts and technical colleges. They will be given for the first time in the college year of 1923-1924.

This new development at Carnegie Tech is another step in line with its policy to train its students to fit the practical demands of various industries. The iron and steel industry, with a capital investment of probably more than five billions of dollars, and with more than a million and a half workers employed in its various branches, apparently, has long suffered from the dearth of trained college men. It is impossible to compute the actual loss through waste that has been met by the industry in training the raw college men coming to it each year. Carnegie Tech and other institutions located close to the metallurgical centers such as Pittsburgh have been continually pressed for their graduates of metallurgy and allied subjects.

England Still Cautious in Buying

Labor troubles have added to the general unemployment in Great Britain—Good business in motor carfield—Selling for replacing a difficulty job

BY OUR LONDON CORRESPONDENT

INDUSTRY in Great Britain still moves at a moderate rate and the engineering section is no exception. Of overseas trading, the figures for June call for little comment—at least as regards imports—but exports, including re-exports, show a decline of about 9½ million pounds in the month. On the other hand, as compared with a year ago considerable increases are to be noted, but once again it may be necessary to mention that strict comparisons cannot be made owing to the setting up of the Irish Free State. The decline in exports last month was chiefly in manufactured goods, particularly in cotton materials.

Several reports regarding fiancial results of firms engaged in engineering, and perhaps more in regard to steel production, have of late made unpleasant reading, and while the Ruhr troubles act as a running sore industry is not likely to be healthy. The numbers of people who imagine that a settlement of the Ruhr problem would by itself mean the complete restoration of pre-war activity and prosperity steadily decrease day by day, for it is recognised that larger areas must be brought into the survey and the effect of war and its aftermath elsewhere must be taken into account. Great Britain has her usual share of labor troubles, and strikes are being directed and carried on against the advice of the leaders and officials of the trade unions to which the strikers themselves belong. The idea that wages must be based to some extent on the cost of living as officially estimated may be pleasant enough when the calculation shows an increase and the time lag is not pronounced, but when the figures imply a lowering of wage rates the result is not always accepted with equanamity, and not for the first time the methods employed in estimating the cost are being assailed.

Unemployment in England

The cost of living, by the way, as computed is 69 per cent above pre-war rates; the strikes may cause the next figures to show a slight increase. The number of people on the registers as totally unemployed is still under the 1½ million mark, with no very material change from week to week, the work people registered as on short time and receiving payment for intervals of unemployment similarly totalling about 63,000, it is reported.

The motor car industry, more particularly the lighter type, has had a better season than was anticipated, and one of the points for discussion among machine tool firms is whether this is likely to mean orders for tools during the coming Winter. Not much is expected, however, as some sections of the industry are water-logged, and, although increases in output have been effected, they have not always led to proportionate increase of profits. Prices have been reduced. One of the firms that during the past season has maintained an output of 500 cars a week and never caught up to its sales possibilities, is increasing its capacity to double that number by the beginning of next year. Further reduction of price is confidently predicted in this case. The commercial vehicle field may be entered, but the chassis will remain standard. The various units are made, some by contact, some in the firm's own factories, some in separate places and are assembled at a centre and it is the works concerned that have to a large extent been encouraging tool makers by asking for quotations, generally, however, for special tools, the designs of which have been drawn up by the manufacturers themselves.

The engine factory, to take an example, is being enlarged by 60 per cent for the increase in production of 100 per cent or more. This firm will be, if not already, the largest producer of the kind in Europe. While it has from year to year steadily increased output it has since the war never been able to meet the demand completely.

The home railways have given out a few more orders but nothing compared with the number hoped for, and India and South America have been mentioned as markets for machine tools in connection with railway development. Few people anticipate a definite improvement in conditions for two or three months. The holiday season is upon us and in normal times this always means that the wheels of industry run slower and, new business is not looked for until the early Autumn.

Increases Not Reductions

Though the idea has been steadily promulgated that price increases rather than reductions are to be expected, it is undoubtedly true that price "considerations" are all important in the acquisition of orders for machine tools. Sometimes it would appear that they can only be sold as "bargains." Some large organizations are now recognized by the industry as following the practice of demanding a discount even where the lowest price quoted indicates a very decided difference as compared with the next competing price. Once seen, the position is easily met. In another large organization, before the officials can obtain sanction for expenditure on new tools they have to demonstrate that compared with the displaced method the estimated yearly usage of a new tool will show a saving in labor cost that includes 5 per cent on the capital cost plus the cost of installing, 5 per cent for depreciation and 5 per cent maintenance, and further, at least another 6 per cent per annum profit on the expended capital. The estimates are made quite fairly, and allowance is made for the scrap value of the machine or machines displaced.

Among minor items we may note that another—the second—of the machine tool firms in Associated British Machine Tool Makers, Ltd., is understood to be withdrawing. To add that in the machine tool world it is the makers of special rather than standard tools who show the most liveliniess is to repeat a many-times-told tale.

Those who are interested may like to know that the Industrial League and Council here, a body which is intended to bring both employer and employed into active co-operation in the consideration of industrial problems, has set up a special committee to consider the problem of efficiency, the co-operation of a number of industrial engineers and cost accountants having been secured. Before long the result of the inquiry will be made public, and it is confidently anticipated that the work of the efficiency engineer will be demonstrated as advantageous.

Will Electrify Henry Ford's Railroad

Contracts aggregating $1,000,000 have been awarded to the Westinghouse Electric & Manufacturing Co., it was announced, for the construction of electrical equipment, including locomotives, for the Detroit, Toledo & Ironton, Henry Ford's railroad. Preparation for the electrification of the first unit of the Detroit, Toledo & Ironton R.R. is under way.

New equipment at the Rouge power house will furnish the motive power for the first electrified unit of the Detroit, Toledo & Ironton. At this power house the original capacity is being doubled. The present generating system, consisting of two 12,500 kw. turbine generators, is being replaced by eight turbine generators each rated at 30,000 kilo volt amperes. The steel work on three of the giant stacks is already completed, and one of the turbines, among the largest in the world, is near completion.

Besides this addition at the Rouge plant, the new plan calls for the building of locomotives, the construction of thirteen and a quarter miles of double track between River Rouge plant and the Flat Rock yards, and many minor changes.

The new electric locomotives for the Detroit, Toledo & Ironton R.R. for freight service will weigh 360 tons. They will have a normal capacity of 4,000 hp. and will be capable of producing 5,000 hp. for an hour. They will have sixteen driving axles and will develop 108,000 pounds drawbar pull at twenty-five miles an hour. Their maximum speed will be forty-five miles an hour.

Iron and Steel Exports Show Decline

Exports of iron and steel from the United States during the first six months of 1923 amounted to 982,144 long tons, as compared with 1,160,177 tons for the corresponding period of 1922. The quantity of iron and steel that left United States ports for foreign lands in June, 1923, however, was higher than the monthly average for last year.

Steel Mills Face Hard Task, Says Bank

"The American Iron and Steel Institute has set about the task, which is no easy one, of completely abolishing the twelve-hour day in that industry," says the official publication of the National City Bank, New York. "The twelve-hour turn was the result of the continuous operation of furnaces, and, although it has been done away with in many departments, has persisted in some because of the difficulty presented by the problem of wage-adjustments to an eight-hour turn. The change might have been made long ago if the workmen had been willing to take the same hourly pay for eight hours that they were receiving for ten hours or if the employers had been willing to give the same pay for eight hours as they were giving for twelve. Changes from ten hours to nine or nine to eight, or even from ten to eight have been comparatively easy to make. Besides the difficulty in reaching a satisfactory adjustment with the workmen now on the twelve-hour turn, the relations between the pay of these men and the pay of men heretofore working eight or ten hours must have attention. The twelve-hour men have been getting more pay than the men on shorter turns, and if they are reduced to eight hours with more pay than other men working eight hours there will be dissatisfaction. Readjustments can be readily accomplished in only one way, and that is by wage-increases and these involve higher costs for iron and steel in farm implements, fence wire, railroad equipment, tools and machinery of all kinds.

"It is conceded that the twelve-hour day should be abolished, on the ground that it keeps men on duty and away from their homes too long at a stretch, but it is not true that the work is exceptionally exhausting, as the actual labor is intermittent and does not aggregate eight hours per day. That the men on the twelve-hour jobs are not eager for other work is evident from the fact that in times of labor shortage, as in 1920 and last Spring when plenty of other work has been available they have not sought it. The same question has come up in the coal industry and the anthracite operators have agreed to do away with the twelve-hour day for men tending pumps.

"An Iowa newspaper, the *Elkader Register*, referring to the announcement for the iron and steel industry drily remarks that 'this will about finish the twelve-hour day except on farms and for housewives and employers."

Penn States Prepares for Summer Courses

The Pennsylvania State College's Summer course in Industrial Engineering will open at State College, Pa., on Aug. 27 and continue to Sept. 8. This course offers an opportunity for representatives of industrial concerns to study co-ordination methods between departments and individuals in industrial establishments.

The college has been studying the problem for several years. The purpose is to provide necessary leadership in co-ordination plans.

For seven years an average of twenty-five plants have sent men to the college's group meetings. The list includes the Westinghouse Electric & Manufacturing Co., the Bethlehem Steel Co., the White Motor Co., and other nationally known concerns. Superintendents, employment managers, store keepers, foremen, cost accountants, foremen and production men have attended.

J. O. Keller, head of the engineering department, has completed arrangements for the sessions.

The course consists of an intensive study of costs, rate setting, personnel, planning and production, with particular reference to their relation to each other. These subjects are gone into through laboratory study and lectures.

In the seven years the college has had this work under way, a co-ordination leadership group has been invited to meet with the college experts for a study of the problems. One of the leaders of industrialists at this year's conference will be Hugo Diemer, widely known industrial engineer.

Plans for Convention of Steel Treaters

The fifth annual convention of the American Society for Steel Treating and the International Steel Exposition will be held in Motor Square Garden, Pittsburgh, Pa., during the week of Oct. 8. Last year there was an attendance estimated at 20,000 when the Exposition was held in Detroit and it is expected that this year an even larger attendance will be recorded.

As an inducement, the railroads are offering a round trip for a fare and a half, but to obtain this reduction it is necessary to write to the headquarters of the society in Cleveland for a certificate that is needed when applying to the railroad for transportation.

Exceptionally able papers have been secured and technical subjects will be thoroughly discussed and reviewed at this convention. Not only papers by the foremost metallurgical engineers of this country, but also papers from Japan, England, France and Germany will be presented.

Missouri Pacific R.R. Has Record Month

July was a record month for the Missouri Pacific R.R. according to reports from L. W. Baldwin, the president, surpassing in traffic any month since October, 1921. During July 82,682 cars of revenue freight were loaded on the system and 30,094 cars were received from connections, a total of 112,776 cars. This exceeds the same month last year by 12,823 cars, a gain of 12.8 per cent.

Trade Catalogs

Belting. The Chas. A. Shieren Co., 37 Ferry St., New York City. A folder of four pages showing belting in its various uses and descriptive matter relative to belting. The folder is perforated for filing.

Lathes, Planers, Shapers and Radials. The American Tool Works Co., Cincinnati, Ohio. A series of circulars showing the many products of the company. The booklet is fastened together in such a manner that it is an easy matter to detach such circulars as may have a special appeal. The booklet is well illustrated with halftones, and cross-section drawings of various machines.

Electric Furnaces for the Laboratory. The Norton Co., Worcester, Mass. The construction of electric furnaces is described by text and illustrations.

Gages. The Waltham Dial Gage Co., 85 Myrtle St., Waltham, Mass. The Waltham 4-in. dial Universal gage is described in a four-page folder.

Electric Hoists. The Shepard Electric Crane & Hoist Co., Montour Falls, N. Y. A booklet of sixty-eight pages, well illustrated showing the various uses of hoists in many different types of factories.

Grate Stokers. Combustion Engineering Corp., Combustion Engineering Building, Broad St., New York. The Coxe traveling grate stoker is described and illustrated in an eight page folder.

Automatic Die Heads. Rickert-Shafer Co., Erie, Pa. Models of die heads are described and illustrated in a twelve-page folder.

Battery Charging Outfit. Hobart Brothers Co., Box 206, Troy, Ohio. Eight-hour battery charging is related in this four-page folder.

Thread Generators. The Fellows Gear Shaper Co., Springfield, Vt. Drawings and halftone illustrations and descriptive text tell of thread generation in this twenty-four page booklet.

Key-Seating and Broaching Machine. The Pawtucket Manufacturing Co., Pawtucket, R. I. The Knowles key-seating and broaching machine with dimensions and descriptions is the subject of this booklet. It is perforated on the side for filing.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

Automobile accessories. Calcutta, India. Purchase. Reference No. 7353.

Automobile parts and accessories. Warsaw, Poland. Purchase and agency. Reference No. 7355.

Bendix drive for electric starters on automobiles. Turin, Italy. Agency. Reference No. 7354.

Five to fifty hp. motors, generators and fans. Hongkong, China. Purchase. Reference No. 7368.

Machinery for manufacturing butts and bolts. Monterey, Mexico. Purchase. Reference No. 7388.

Hand and twist drills. Tokyo, Japan. Purchase. Reference No. 7372.

Ball bearings, steel bearings and roller bearings. Warsaw, Poland. Purchase and agency. Reference No. 7371.

Forthcoming Meetings

The Supply Association of the American Railway Tool Foreman's Association. Hotel Sherman, Chicago, Ill., Aug. 29, 30 and 31. Eleventh annual convention. Herbert S. White, Cleveland Twist Drill Co., 9 North Jefferson St., Chicago, Ill., secretary and treasurer.

New Haven Branch of the American Society of Mechanical Engineers. Third annual machine tool exhibit Sept. 18, 19, 20 and 21. Mason Laboratory, New Haven, Conn. A. C. Jewett, chairman.

Association of Iron and Steel Electrical Engineers. Iron and steel exposition, Buffalo, Sept. 24 to 28. John F. Kelly, secretary, Association of Iron & Steel Electrical Engineers, 708 Empire Building, Pittsburgh, Pa.

American Society for Steel Treating. Annual convention at Pittsburgh in connection with the International Steel Exposition, Oct. 8, 9, 10, 11 and 12. W. H. Eisenman, 4600 Prospect Ave., Cleveland, Ohio, national secretary.

Society of Automotive Engineers. Production meeting at Cleveland, Ohio, Oct. 25 and 26. Headquarters, 29 West 39th St., New York City.

American Management Association. October 29, 30, and 31, Hotel Astor, New York City.

New and Enlarged Shops

Machine Tools Wanted

Conn., New Haven—Connecticut Co., 22 Church St.—complete garage and small machine shop equipment.

Ill., Chicago—J. J. Benas, 144 West Kinzie St. (machinist)—power punch press.

Ill., Chicago—Illinois Central R.R., 135 East 11th Pl., J. J. Bennett, Purch. Agt.—one 500 lb. power hammer.

Kan., Dodge City — Allen-Combs Motor Co.—power drill press for garage.

Kan., Dodge City—Davis Electric Co., 201 2nd Ave.—power metal lathe.

Kan., Dodge City—Gingrich Garage, 407 W. Chestnut St., F. Gingrich, Purch. Agt.—Babbitting machine and cylinder grinder.

Kan., Dodge City—D. C. Godfrey, 203 2nd Ave.—automobile cylinder grinder for machine shop.

Kan., Dodge City—E. C. Haynes (machine shop)—power lathe, drill press, emery stand, belting, hangers, bearings, shafting, pulleys and cutting off machine.

Kan., Dodge City—Jenkins Bros., 101 2nd St., D. J. Jenkins, Purch. Agt.—cylinder grinder for garage (used).

Kan., Dodge City—Kennedy Bros. (garage and machine shop)—power drill press.

Ky., Louisville—Hilton Collins Co., 1300 12th St. (boiler and plate shop)—100 lb. helve hammer, bull dozers and metal punch.

Md., Baltimore—Beckerley & Trusler, 614 East Lombard St. (marine supplies, machinery, etc.) C. Trusler, Purch. Agt.—Landis bolt cutting and threading machine, largest capacity.

Mass., Boston—H. Swanson, c/o J. H. MacNaughton, Archt., 177 State St.—machinery for new machine shop.

Mass., East Cambridge (Boston P. O.)—Viscol Co., 200 1st St. (manufacturer of oil and grease)—lathe with 2 in. hollow spindle, 8 ft. bed, 18 in. swing; medium size milling machine (used).

Mass., Pittsfield—Smith & McCarthy—machine tools for new automobile repair shop.

Mass., Quincy—Colburn Gear & Mfg. Co., 98 Holmes St.—machinery for proposed 1 story machine shop.

Mass., Taunton—Magee Furnace Co. (manufacturer of stoves, ranges and furnaces)—1 ton deep throat press for sheet metal work (used).

Mich., Ramsay—Castile Mining Co., E. W. Hopkins, Purch. Agt.—hoisting machinery, iron planer, drill press and lathe, all for heavy duty repair work.

Mo., Kansas City—P. A. Stutermeister Supply Co., 1909 McGee St. (machine shop)—½ in. electric drill (used).

N. J., Jersey City — Bertolette Machine Tool Co., 357 West Side Ave.—16 ft. plate bending rolls, punches and shear.

O., Columbus—Higgy-Avery Co., 1199 Franklin Ave. (manufacturer of radio and electrical equipment), R. C. Higgy, Mgr.—small drill press and boring machine.

O., Columbus—Jaeger Machine Co., 502 Dublin Ave., G. Jaeger, Mgr.—one 24 in. lathe, drill press and other equipment for general machine shop.

O., East Palestine—Wayman Electric & Mfg. Co.—punch presses, sensitive drills and tapping machines.

Pa., Phila.—Budd Mfg. Co., 25th St. and Hunting Park (manufacturer of automobile bodies)—cranes, steel presses, etc., for proposed $350,000 factory.

Pa., Phila.—Koelle-Greenwood Motor Co., 6025 Germantown Ave.—lathes, vulcanizers and tools for proposed $100,000 automobile sales and service station.

Wis., Baraboo—Baraboo Auto Wrecking Co., L. Leno, Purch. Agt. — 22 in. drill press, 6 to 8 ft. lathe, air compressor, grinder and chain hoist.

Wis., Kenosha—Mantkus Motor Sales Co., Elizabeth St. and Howland Ave.—gasoline tanks, pumps, chain hoist, drill press, small lathe and small tools.

Wis., Madison — University Motor Co., 2201 University Ave., J. Fishnick, Mgr.—automobile repair machinery and small tools for proposed garage and repair shop.

Wis., Merrill—E. Trantow, South Foster St.—automobile repair machinery, drill press, chain hoist and small tools for proposed garage and repair shop.

Wis., Milwaukee — Universal Clothes Presser Mfg. Co., 1356 Forest Home Ave. (manufacturer of patent clothes presser), W. H. Dick, Purch. Agt.—drilling machine, 6 ft. lathe, emery wheels, etc.

Wis., New London—New London Motor Co.—garage equipment, air compressor, gasoline storage tanks and pumps.

Ont., Toronto—International Petroleum Co., 56 Church St.—one 30 in. squaring shears.

Ont., Toronto—J. G. Pendrith, 970 Queen St. W.,—Lathe, drills, etc. for proposed $50,000 machine shop.

Que., Acton Vale—R. Boisvert, Railway St.—garage equipment.

Que., Amos—Garage Bacon, J. Bacon, Purch. Agt.—additional equipment for garage and automobile repairs.

Que., Cap de Madeleine (Three Rivers, P. O.)—Garage Montplaisir, Notre Dame St.—garage equipment.

Que., Cap de Madeleine (Three Rivers, P. O.)—Rocheleau & Frere, A. Rocheleau, Purch. Agt.—automobile repair shop and garage equipment.

Que., Montreal—G. Daigneault, 1301 Cartier St.—complete equipment for automobile repair shop.

Que., Montreal—Montreal Wire Wks., Ltd., 50 Craig St. W., E. Doral, Purch. Agt.—one buffer and one set punching shears.

Que., St. Valerien—O. Laframbois—garage, automobile repair and blacksmith shop equipment.

Que., Three Rivers—Garage National, 313 St. Maurice St., E. Marchand, proprietor—automobile repair equipment.

Que., Three Rivers—I. H. Guillemette, 46 Badeaux St.—garage and repair equipment.

Que., Three Rivers—Lymburner Garage, 99 St. Antoine St.—garage and automobile repair shop equipment.

Que., Three Rivers—F. A. Papin, 380 Notre Dame St.—garage and automobile repair equipment.

Que., Three Rivers—Reid Motor, Ltd., 432 St. Maurice St., A. Reid, Purch. Agt.—garage and automobile repair equipment.

Machinery Wanted

Calif., Oakland—Kaiser Paving Co., 1st Natl. Bank Bldg.—equipment for gravel pit at Livermore.

Conn., New Britain—The city, Bd. of Health—complete refrigerating machinery for slaughter house.

Fla., Jacksonville—Florida Steel & Wire Co., Professional Bldg.—machinery for the manufacture of nails.

Ga., Athens—Athens Hosiery Mills—Scott & Williams model B-5 half-hose machines, 3½ in. diameter, 200 needles, 48 gauge, high spliced heel and double toe.

Ga., Athens—C. L. Upchurch & Sons, Box 801 (hosiery)—ten No. 30 Foster cone winders with 100 spindles each (used).

Ga., Barnesville — Collier Mill's (underwear)—Scott & Williams or Wildman body machines, 10 or 12 cut, sizes 16 to 24 in. inclusive.

Ia., Dubuque—The city, O. E. Carr, Mgr. —15 ton electric traveling crane.

Kan., Dodge City — Anawalt Campbell Mercantile Co., 3rd and Chestnut Sts. (lumber and planing mill)—cutting off machine.

Kan., Dodge City—Barker Bros., 619 3rd Ave. (cabinet maker)—wood lathe and belt sander.

Kan., Dodge City—Brown & Castanien—wood lathe.

Kan., Dodge City—Dodge City Journal, F. Sailors, Purch. Agt.—power job press and Miller feeder.

Kan., Dodge City—Dodge City Printing Co., 310 Chestnut St.—power saw and trimmer.

Kan., Dodge City—Etrick Printing Co., 314 Chestnut St.—power paper cutter and saw trimmer.

Ky., Louisville—Pendennis Club, 324 W. Walnut St., B. B. Davis, Norton Bldg., Purch. Agt.—complete laundry equipment for 2 story, $25,000 addition to club building.

Mass., Boston—Jealous & Fitch Co., 10 High St.—additional machinery for yarn mill for the Virginia Worsted Co., Norfolk, Va.

Mass., Brookline (Boston P. O.)—Brannen's Wet Wash Laundry, 74 Kent St.—pulleys, shafting and belting to operate washing and drying machines.

Mass., Dorchester (Boston P. O.)—G. N. Lawson, 242 Freeport St. (boat builder)—18 or 20 in. surface planer (used).

Mass., Dorchester (Boston P. O.)—H. D. Malone, 324 Ashmart St.—machinery and equipment for laundry at 15 Barnes St.

Mass., Gardner—Bd. Educ.—woodworking machinery, including lathe, planer, matcher, saws, tables, benches, shafting, pulleys and small tools for manual training department of new high school.

Mass., Medford—E. Teel & Co., 70 Union St. (manufacturer of truck and wagon bodies)—two 1½ ton chain hoists, metal workers' shears, drills, reamers and other small wood and metal working tools.

Miss., Meridian—M. M. Lockwood, P. O. Box 315—stiff mud brick machine, including drier.

Mo., Kansas City—C. W. Bechtel, Sr., 5645 Virginia Ave.—woodworking machinery.

N. Y., Brooklyn—Wheeler Salvage Co., 224 Bush St.—steel tanks for 100 lb. pressure, also fuel oil pump, 6 in. suction.

N. Y., New York — A. Loewy — baling presses.

N. C., High Point—McEwery Lumber Co. —saw trimmer, direct electric drive.

N. C., Rocky Mount—Rocky Mount Mills Co. (manufacturer of cotton yarns)—$130,000 worth of equipment for proposed addition to mill.

N. C., Wilmington—Carter's Production Wks., 210 South Front St. (machinery), O. Carter, Mgr.—complete sawmill plant, 15,000 capacity.

O., Cleveland—B. Bell, 3531 East 118th St. (dry cleaner)—three tumbler machines and a 500 gal. gasoline storage tank.

O., Cleveland—West Cleveland Trim & Hardwood Co., c/o H. W. Stearns, 14651 Lorain Ave.—planing mill equipment.

O., Columbus—Dept. of Purchase, State House—milk pump, pasteurizer, etc., for Grafton Farm, Cleveland State Hospital.

O., Columbus—Winslow Glass Co., Southwood Ave. and 19th St., P. Winslow, Genl. Mgr.—glass manufacturing equipment to enlarge plant.

O., Dayton—Bd. Educ., Ludlow Bldg., C. J. Schmidt, Clk.—receiving bids until Sept. 4 for wood and metal working machinery; printing shop machinery and equipment; laundry equipment for Roosevelt High School.

Okla., Commerce—S. S. & G. Mining Co. —electric hoist for ore.

Pa., Pittsburgh—Dravo Contg. Co., Diamond Natl. Bank Bldg.—structural shape working machinery.

Tenn., Jacksonville—M. B. Automotive Corp.—equipment for the manufacture of autobuses, trucks, etc.

Tex., Corsicana—Navarro Ice Co., South 12th St. along tracks of Cotton Belt R.R.—machinery for proposed $100,000 ice plant.

W. Va., Dunbar — Dunbar Flint Glass Corp., J. M. Payne, Pres.—link belt and conveyor system, also transmission equipment.

The Weekly Price Guide

RISE AND FALL OF THE MARKET

Iron and Steel—Pig-iron prices still weak, despite recent active buying. Finished steel market firmer; decline in scrap prices checked. July steel ingot output dropped over 222,000 tons from the June total, and unfilled orders of the U. S. Steel Corp. fell off 475,498 tons, during month. August steel demand showing improvement over July. Oil and building industries most conspicuous buyers. Revival expected in railroad and automobile demand. Steel pipe requirements large; stocks small. Less difficulty experienced in getting prompt mill deliveries. Prices unchanged; shapes and plates, $2.50 and bars, $2.40 per 100 lb., f.o.b. mill.

Advances—Tin rose ¾c. per lb. in New York during week. Coppered bessemer rods firmer. Antimony, 10c. in Cleveland, against 9½c. per lb., last week. Copper market shows improvement. Lubricants in better demand.

Declines—Zinc dropped 5c. per 100 lb. in New York, during week. Open-hearth spring steel down about ½c. per lb. Aluminum ingots declined ½c. per lb. Raw linseed oil $1.18, compared with $1.22 per gal. (5 bbl. lots) in Cleveland; market soft in other cities. Furnace and foundry coke down 25c. to 50c. per ton.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$28.55
Northern Basic	28.77
Southern Ohio No. 2	28.77
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	34.25
BIRMINGHAM	
No. 2 Foundry	25.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	27.76
Virginia No. 2	32.17
Basic	26.76
Grey Forge	26.76
CHICAGO	
No. 2 Foundry local	28.61
No. 2 Foundry, Southern (silicon 2.25@2.75)	30.51
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	27.77
Basic	26.77
Bessemer	28.77

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	6.75
Cleveland	6.75@7.40
Cincinnati	7.50
New York	5.50@7.00
Chicago	5 00@5.50

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	3.00	4.59	3.75	4.15
No. 12	3.10	4.64	3.80	4.20
No. 14	3.20	4.69	3.85	4.25
No. 16	3.40	4.79	3.95	4.35
Black				
Nos. 17 and 21.	3.70	4.95	4.45	5.05
Nos. 22 and 24.	3.75	5.00	4.50	5.05
Nos. 25 and 26.	3.80	5.05	4.55	5.10
No. 28	3.85	5.15	4.65	5.20

Galvanized	Pittsburgh	New York	Cleveland	Chicago
Nos. 10 and 11.	4.00	5.15	4.70	5.35
Nos. 12 and 14.	4.10	5.25	4.80	5.45
Nos. 17 and 21.	4.40	5.55	5.10	5.75
Nos. 22 and 24.	4.55	5.70	5.25	5.90
No. 26	4.70	5.85	5.50	6.05
No. 28	5.00	6.15	5.80	6.35

WROUGHT PIPE (Welded)—The following mill discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
		BUTT WELD			
1 to 3	62	50½	¾ to 1½	30	13
		LAP WELD			
2	55	43½	2	23	7
2½ to 6	59	47½	2½ to 4	26	11
7 and 8	56	43½	4½ to 6	28	13
9 and 10	54	41½	7 to 12	26	11
11 and 12	53	40½			
		BUTT WELD, EXTRA STRONG, PLAIN ENDS			
1 to 1½	60	49½	¾ to 1½	30	14
2 and 3	61	50½			
		LAP WELD, EXTRA STRONG, PLAIN ENDS			
2	53	42½	2	23	9
2½ to 4	57	46½	2½ to 4	29	15
4½ to 6	56	45½	4½ to 6	28	14
7 and 8	52	39½	7 and 8	21	7
9 and 10	45	32½	9 to 12	16	2
11 and 12	44	31½			

Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded.	48%	34%	55½%	43½%	50%	37%
2½ to 6 in. steel lap welded.	44%	30%	53½%	40½%	47%	34%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 15%. Cast iron, standard sizes, 17½% off.

SEAMLESS STEEL TUBING—Following base discounts are on 20 gauge or .035-in., round, cold-drawn tubing, ¼-in. to 1-in., O.D., weighing 0.17 lb. to 0.36 lb. per ft. Cutting charge per 100 cuts, $1.50 to $1.58:

O.D. Inches	List Price per ft.	Differential Discount	O.D. Inches	List Price per ft.	Differential Discount
¼	$0.09	50%	¾	$0.16	35%
⅜	.11	45%	1	.18	31%
½	.14	40%			

NOTE—The discounts are to be lowered by the following differentials in the case of regular .10-.20 carbon: 25,000 ft. or over, 83; 15,000 to 25,000 ft., 82; 5,000 to 15,000 ft., 81; 1,000 to 5,000 ft., 80; less than 1,000 ft., 79.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.50
Spring steel (light) (base)	7.00	6.00	6.00
Coppered Bessemer rods (base)	8.00	8.00	6.55
Hoop steel	5.19	4.66	4.55
Cold rolled strip steel	7.50	8.25	7.25
Floor plates	5.80	5.66	5.80
Cold finished shafting or screw	4.40	3.90	4.55
Cold finished flats, squares	4.90	4.40	5.05
Structural shapes (base)	3.64	3.46	3.40
Soft steel bars (base)	3.54	3.36	3.20
Soft steel bar shapes (base)	3.54	3.36	3.20
Soft steel bands (base)	4.39	3.61	3.95
Tank plates (base)	3.64	3.46	3.30
Bar iron (3.25 at mill)	3.54	3.36	3.20
Carbon tool steel	11.00	....	....
Drill rod (from list)	55%	40@55%	50%

Electric welding wire, New York, 1/12 8.35c.; ⅛, 7.85c.; 5/32 to ¼, 7.35c. per lb.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			15.00
Tin, 5-ton lots, New York			39.75
Lead (up to carlots), St. Louis	6.50	New York	6.97½
Zinc (up to carlots), St. Louis	6.20	New York	6.60

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	26.10	27.00	28.00
Antimony (Chinese), ton spot	8.75	10.00	8.25
Copper sheets, base	24.50	23.50	23.00
Copper wire (l.c.l.)	17.25	20.75	16.25
Copper bars (l.c.l.)	22.00	24.00	19.50
Copper tubing (l.c.l.)	27.00	29.00	23.00
Brass sheets (l.c.l.)	19.75	29.25	18.75
Brass tubing (l.c.l.)	25.50	29.25	20.50
Brass rods (l. c. l.)	18.00	29.00	15.75
Brass wire (l. c. l.)	20.25	23.75	.....
Zinc sheets (casks)	10.25	10.10	.....
Solder (½ and ½), (case lots)	29.50	27.75	20.00
Babbitt metal (83% tin)	52.00	48.00	40.00
Babbitt metal (35% tin)	25.00	17.00	16.00
Nickel (ingot and shot)	29.00	.....	35 00
Nickel (electrolytic)	32.00	.....	35.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel sheet (base)	57.00
Hot rolled rods, Grade "A" (base)	55.00
Cold drawn rods, Grade "A" (base)	63.00
Copper nickel ingots	37.00
Hot rolled copper nickel rods (base)	45.00
Manganese nickel hot rolled rods "E"—low manganese (base)	57.00
Manganese nickel hot rolled rods "D"—high manganese (base)	60.00

Base price of monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled rods (base)	40.00
Blocks	32.00	Cold drawn rods (base)	48.00
Ingots	38.00	Hot rolled sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	12.00	12.00	12.50
Copper, heavy, and wire	11.50	11.50	11.50
Copper, light, and bottoms	10.00	9.50	10.50
Lead, heavy	5.00	5.00	5.00
Lead, tea	4.00	4.00	3.75
Brass, heavy, yellow	7.50	....	7.50
Brass, heavy, red	9.50	9.50	9.50
Brass, light	6.00	5.00	6.50
No. 1 yellow brass turnings	7.00	6.00	7.00
Zinc	3.75	3.00	3.75

TIN PLATES—American Charcoal—Bright—Per box.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	20x28, 112 sheets	$23.50	$19.50	$18.50
"A" Grade:				
IC,	20x28, 112 sheets	21.00	17.00	17.00
	Coke Plates—Primes, 20x28 in.			
100-lb.,	112 sheets	14.00	12.60	14.50
	Terne Plates—Small lots, 8-lb. Coating			
IC,	14x20	8.25	6.55	7 40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.10@0.13	$0.15	$0.11
Cotton waste, colored, per lb.	.08@.13	.12	.08
Wiping cloths, 13½x13½, per lb.	10.25	36.00 per M	.10
Wiping cloths, 13½x20½, per lb.	....	52.00 per M	.13
Sal soda, per 100 lb.	1.65	2.25	2.65
Roll sulphur, per 100 lb.	3.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	1.05	1.18	1.14
White lead, dry or in oil	100 lb. kegs.	New York,	14.00
Red lead, dry	100 lb. kegs.	New York,	14.00
Red lead, in oil	100 lb. kegs.	New York,	15.50
Fire clay, per 100 lb. bag		.65	.60
Coke, prompt furnace, Connellsville	per net ton	$4.00@4.50	
Coke, prompt foundry, Connellsville	per net ton	5.25@5.50	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	30%	50-10%	45-5%
1½ and 1½x3 in. up to 12 in.	15%	50%	50%
With cold punched hex. nuts up to 1 in. diam. (plus std. extra of 10%)	15%	$3.50 net	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	20%	3.50 net	$4.00 off
Button head bolts, with hex. nuts	List net	List net	.....
Hex. head and hex. nut bolts	List net	.....	65-5%
Lag screws, coach screws	30%	.....	60-5%
Square and hex. head cap screws	60%	70%	70-10%
Carriage bolts, up to 1 in. x 30 in.	25%	45%	40-5%
Bolt ends, with hot pressed nuts	30%	.....	55%
Tap bolts, hex. head, list plus	35%	... .	.....
Semi-finished nuts, ⅝ and smaller	60%	.....	....
Semi-finished nuts, ¾ and larger	55%	65-10%	60%
Case-hardened nuts	40%	.. ....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$6.50	$4.00	$3.50
Washers, cast iron, ⅜ in., per 100 lb. (net)	5.50	4.00	3 50
Washers, round plate, per 100 lb. Off list	1 50	4.00	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	List net	2.75	2.50
Nuts, hot pressed, hex., per 100 lb. Off list	List net	2.75	2.50
Nuts, cold punched, sq., per 100 lb. Off list	List net	2.75	2.50
Nuts, cold punched, hex., per 100 lb. Off list	List net	2.75	2.50
Rivets:			
Rivets, ⅞ in. dia. and smaller	40%	50-10%	60%
Rivets, tinned	40%	50-10%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb. (net)	$5.50	$3.90	$3.75
Cone heads, ditto (net)	5.60	4.00	3.85
1½ to 1¾-in. long, all diameters, *EXTRA* per 100 lb.	0.25	.....	0.15
¾ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb. *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.70 base

Lard cutting oil (50 gal. bbl.) per gal.	$0.55	$0.50	$0.67½
Machine lubricant, medium-bodied (50 gal. bbl.), per gal.	0.297	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 2c. per sq.in., per ply:			
Medium grade	30-10%	30-10%	30-10%
Heavy grade	20-5-2½	30%	20-5-2½%
Rubber and duck:			
First grade	50-10-5%	50-10%	40-10%
Second grade	60-10%	60-5%	60-5%
Abrasive materials—In sheets 9x11 in.,			
No. 1 grade, per ream of 480 sheets:			
Flint paper	$6.30	$5.84	$6.48
Emery paper	9.90	11.00	8.80
Emery cloth	31.12	31.12	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll.	4.73	4.28	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100:			
Paper	1.49	1.24	1.40
Cloth	3.38	2.67	3.20

Wis., Aniwa—Bd. Educ., R. Perry, Clk.—30 in. bandsaw, wood turning lathes, drill press, medium size planer, glueing machine and rip saw.

Wis., Appleton—Fox River Paper Co., Water St.—paper machine for proposed addition to mill.

Wis., Beloit—Keeler Lumber & Fuel Co., 108 State St.—coal hoisting and loading machinery for proposed $30,000 coal elevator.

Wis., Green Bay—Green Bay Newspaper Co., 315 Cherry St.—additional presses for proposed $100,000 newspaper plant.

Wis., Madison—M. B. Allison, 119 Monrova Ave.—refrigeration machinery and plant, either ammonia or brine.

Wis., Markesan—O. F. Guderian and H. Terens—pea canning machinery, belts, shafting and power machinery for proposed $50,000 canning plant at Cobb.

Wis., Manitowoc—Grimm Aluminum Casting Co., South 21st St.—cupola and furnace for proposed $40,000 foundry.

Wis., Milwaukee—M. Ert, 530 Jefferson St. (garage)—one large size air compressor, vulcanizing outfit, etc.

Wis., Milwaukee—G. Ladwig, 668 American Ave. (carpentry and millwork)—one standard window frame making machine.

Wis., Milwaukee—Ludwig Shoe Mfg. Co., 216 Harmon St., J. L. Ludwig, Purch. Agt.—shoe working machinery, including lasting machine, cutters, vampers and punches.

Wis., Milwaukee—Milwaukee Coke & Gas Co., 187 Greenfield Ave.—steel tanks and distilling apparatus for proposed $100,000 benzol plant.

Wis., Milwaukee—Natl. Family Laundry, 786 12th St.—mangiers, power washers, mechanical dryers, belting, shafting and hangers.

Wis., Milwaukee—Northeast Power Co., 559 Marshall St., W. Pulliam, Purch. Agt.—one electric traveling crane.

Wis., New London—M. Smith—small tools, gasoline storage tanks, pumps and air compressor for proposed $40,000 garage.

Wis., Prairie Farm—C. L. Borson (planing mill)—rip saws and heavy duty planer.

Wis., Racine—School Dist. 11, A. Harcus, R.F.D., Secy.—small woodworking tools, benches, etc. for proposed grade school building.

Wis., West Allis—G. Dallmann, 898 69th Ave. (carpentry and millwork)—portable combination woodworking machine, standard size.

N. S., Lunenburg—Smith & Rhuland—extensive equipment for ship building.

N. S., New Glasgow—I. W. Cummings & Sons, Ltd. (manufacturer of mine tools, cars, forgings, etc.), J. T. Cummings, Genl. Mgr.—additional equipment for the manufacture of manganese toughened steel, self oiling wheels and axles for mine cars.

N. S., Stellarton—D. Porter & Son (woodworking)—moulder, matcher, etc.

Ont., Alexandria—F. McCormack—wool carding and batting equipment.

Ont., Fort Erie—Campbell-Alladin Gas Maker, Ltd., F. M. Campbell, Purch. Agt.—small machinery and tools.

Ont., Galt—Galt Forge, 38 Ainslie St., S., D. Ford, Purch. Agt.—equipment for angle iron work and flanging.

Ont., Maxville—A. J. McEwan (saw and planing mill)—additional sawing equipment.

Ont., Monkton—Monkton Cheese & Butter Co., A. Petrie, proprietor—equipment to replace that which was destroyed by fire.

Ont., Guelph—Guelph Specialty Mfg. Co., Ltd., A. R. Burrows, Purch. Agt.—machinery and equipment for the manufacture of mops, polishes, car washers, bottle holders, tools, etc.

Ont., Windsor—Canadian Roofing Co., McDougall St.—machinery and equipment to replace that which was destroyed by fire.

Que., Montreal—F. Flaba, 2660 St. Hubert St.—laundry equipment.

Que., Montreal—Henderson-Baruck Co., Ltd., 1 Oliver St. (tinsmith)—additional equipment.

Que., Montreal—Meldrum Iron Wks., Ltd., 1140 Lajoie St., G. H. Meldrum, Purch. Agt.—machinery and equipment for the manufacture of ornamental iron, steel and brass.

Que., Montreal—Western Quebec Paper Mills, Ltd., c/o W. K. McKeown, 145 St. James St.—pulp and paper machinery.

Que., Three Rivers—O. Garceau, 289 Laviolette St.—additional equipment for blacksmith shop.

Que., Three Rivers—Three Rivers Brass Fdry., 106 St. George St., O. Dumont, Purch. Agt.—additional foundry equipment.

Que., Upton—J. Lamadeleine—additional equipment for blacksmith shop.

Metal Working Shops

Ark., Brinkley—W. F. Brown is having preliminary plans prepared for the construction of a 1 story, 60 x 80 ft. garage. Estimated cost $45,000. E. W. Mann, Madison Ave. Bldg., Memphis, Tenn., Archt.

Calif., Emeryville—Standard Underground Cable Co., First National Bank Bldg., San Francisco, is having plans prepared for the construction of a factory, including 100 x 300 ft. main building, power house and warehouse. Estimated cost $200,000. A. Prack, c/o Westinghouse Electric & Mfg. Co., Emeryville, Archt.

Calif., San Francisco—The Great Western Smelting & Refining Co., Folsom and Spear Sts., is having plans prepared for the construction of a 1 story foundry. Estimated cost $80,000. Morrow & Garren, Chronicle Bldg., San Francisco, Archts.

Calif., San Francisco—The Williams Bros. Aircraft Corp., 1211 Van Ness Ave., awarded the contract for the construction of a 1 and 2 story factory on 25th St. and Potrero Ave. Noted July 19.

Calif., Santa Monica—C. C. Haworth is having plans prepared for the construction of a 1 story, 100 x 150 ft. garage. Estimated cost $40,000 A. G. Bailey, Junior Orpheum Bldg., Los Angeles, Archt.

Conn., Hartford—F. D'Esopo, 647 Main St., is having plans prepared for the construction of a 1 story, 50 x 70 ft. garage at 161 State St. Estimated cost $40,000. H. B. Sumner, 45 Gold St., Hartford, Archt.

Conn., New Haven—The Connecticut Co., 22 Church St., is receiving bids for the construction of a 1 story, 68 x 210 ft. garage and machine repair shop for automobile buses. Estimated cost $60,000. Harte & Stamur, c/o owner, Engrs. and Archts.

Conn., Waterbury—The Amer. Brass Co., Grand and Meadow Sts., awarded the contract for the construction of a 1 story, 75 x 210 ft. garage on Freight St. Estimated cost $40,000.

Conn., Waterbury—The French Mfg. Co., 128 Robbins St., awarded the contract for the construction of a 1 story, 72 x 120 ft. addition to its factory for the manufacture of small tubing. Estimated cost $40,000.

Conn., Waterbury—The Scoville Mfg. Co., 99 Mill St., manufacturer of brass goods, awarded the contract for remodeling its factory on East Main St. Estimated cost $50,000.

Ill., Chicago—D. H. Patterson, c/o Holton, Seeleye & Co., 140 South Dearborn St. is receiving bids for the construction of a 1 story, 125 x 135 ft. garage at 1314-28 East 53rd St. Estimated cost $40,000. L. E. Russell, 25 North Dearborn St., Archt.

Kan., Hoisington—B. Whalen will build a 45 x 90 ft. machine shop. Estimated cost $5,000.

Kan., Topeka—The Simplex Rim Co., c/o L. L. Pearce, 3824 East 1st St., Wichita, is having preliminary plans prepared for the construction of a 2 story factory for the manufacture of patented automobile rims. Estimated cost $75,000. Private plans.

Mass., Quincy—Colburn Gear & Mfg. Co., 98 Holmes St., will build a new 1 story machine shop.

Minn., Austin—The Austin Auto Co. awarded the contract for the construction of a 1 story, 85 x 140 ft. garage on Lansing Ave. Estimated cost $45,000.

Mo., St. Louis—J. F. Queeny, 3453 Hawthorne Blvd., is having plans prepared for remodeling 6 story hotel building into garage, on Bway. Estimated cost $175,000. Mauran, Russell, Crowell, Chemical Bldg., Archts.

N. Y., Albany—J. D. Parsons, 93 North Pine Ave., manufacturer of store fixtures, plans to rebuild portion of his plant recently destroyed by fire. Loss $175,000.

N. Y., Albany—E. V. Stratton Motors Co., 25 Washington Ave., is having plans prepared for the construction of a 10 story, 60 x 140 ft. garage and office building.

N. Y., Brooklyn—L. Gershowitz, c/o E. M. Adelsohn, Engr. and Archt., 1778 Pitkin Ave., is having plans prepared for the construction of a 1 story, 100 x 100 ft. garage on 1st St. Estimated cost $40,000.

N. Y., New York—Garrison Ave. Constr. Co., c/o D. S. Lang, Archt. and Engr., 110 West 40th St., will build a 1 story garage on Garrison and Bryant Aves. Estimated cost $50,000.

N. Y., New York—C. S. Levy, c/o Moore & Landseidel, Engrs. and Archts., 148th St. and 3rd Ave., will build a 1 story, 105 x 125 ft. garage on West 145th St. Estimated cost $50,000.

N. Y., West New Brighton—The President of the Borough of Richmond, Room 108, Borough Hall, Staten Island, will soon award the contract for the construction of a repair shop and garage on Clove Rd. south of Castleton Ave., here.

N. C., Charlotte—Etheredege Meter Co. plans to construct a garage and salesroom building. Estimated cost $100,000. Lockwood, Greene & Co., Charlotte, Engrs.

N. C., South Rocky Mount (Rocky Mount P. O.)—The Atlantic Coast Line Ry., Atlantic Coast Line Bldg., Wilmington, will soon receive bids for the construction of coach shops here. Estimated cost $500,000. J. E. Willoughby, Ch. Engr.

O., Cleveland—Amer. Stove Co., 4415 Perkins Ave., has had plans prepared for the construction of a 1 story, 72 x 132 ft. enameling plant addition on Hough Ave. Estimated cost $40,000. Carter-Richards Co., Engineers Bldg., Archts.

O., Cleveland—Globe Brass & Mfg. Co., 5532 Perkins Ave., is having plans prepared for the construction of a 1 story machine shop and foundry, on East 55th St, near Bower Ave. Estimated cost $60,000. H. F. Schroeder, Pres. A. C. Wolf and F. M. Griffith, Truman Bldg., Archts.

O., Cleveland—Jordan Ohio Co., 4400 Euclid Ave., had plans prepared for the construction of a 1 story, 50 x 103 ft. garage. Estimated cost $40,000. Hubbell & Benes, 4500 Euclid Ave., Archts.

O., Cleveland—The Standard Oil Co. of Ohio, c/o J. A. Watterson, East Ohio Gas Bldg., has had plans prepared for the construction of a 1 and 2 story garage and pump house on Berea Rd.; also a 1 and 2 story, 28 x 80 ft. and 32 x 92 ft. garage and pump house on Babbitt Rd. and St. Clair Ave. Estimated cost $40,000 and $50,000 respectively. Private plans.

Pa., Altoona—The Davis Murray Motor Co., 1921 Union Ave., plans to build a 3 story, 25 x 100 ft. garage and a 1 story, 25 x 120 ft. sales and show room. Estimated cost $100,000. J. R. Davis, Pres.

Pa., Bellefonte—Decker Bros., North Spring St., are having plans prepared for the construction of a 3 story, 90 x 120 ft. garage and service station. Estimated cost $80,000. Private plans.

Pa., Dormont (Pittsburgh P. O.)—Bartey Bros., West Liberty Ave., is receiving bids for the construction of a 2 story, 50 x 67 ft. garage on McFarlane Rd. Estimated cost $40,000. Private plans.

Pa., Phila.—The Budd Mfg. Co., 25th St. and Hunting Park, manufacturer of automobile bodies, will soon award the contract for the construction of a 6 story, 100 x 325 ft. and 1 story, 75 x 325 ft. factory on Hunting Park Ave. and Wissahickon Rd. Estimated cost $350,000. Ballinger Co., 12th and Chestnut Sts., Archts.

Pa., Phila.—P. S. Tyre, Archt., 1509 Arch St., will receive bids until Aug. 22 for the construction of a 2 story, 70 x 209 ft. automobile sales and service station on Chelton Ave. east of Wayne St for the Koelle-Greenwood Motor Co., 6025 Germantown Ave. Estimated cost $100,000.

Pa., Uniontown—M. Friedman is receiving bids for the construction of a 2 story, 124 x 150 ft. garage on Fayette and Wilson Sts. Estimated cost $40,000. Private plans.

Wis., Manitowoc—W. J. Raeuber, Archt., South 8th St., is receiving bids for the construction of a 2 story, 50 x 100 ft. foundry for the Grimm Aluminum Casting Co., South 21st St. Estimated cost $40,000.

Wis., Milwaukee—Jim's Repair Shop, 1524 Galena St., will receive bids about Aug. 27 for the construction of a 1 story, 50 x 100 ft. machine and repair shop for automotive service.

Wis., Milwaukee—A. Seidenschwartz, Archt., 290 3rd St., is receiving bids for the construction of a 1 story, 50 x 77 ft. addition to foundry for the Milwaukee Steel Fdry. Co., 127 South Water St. Estimated cost $45,000.

Wis., Racine—F. Applegate, 1043 Washington St., is receiving bids for the construction of a 1 story, 60 x 105 ft. garage and repair shop. Estimated cost $55,000. Noted July 5.

Wis., Racine—H. Koelbel, 2116 16th St., is receiving bids for the construction of a 1 story, 40 x 110 ft. garage and repair shop on 15th and Racine Sts. W. J. Redden, 2819 Arlington Ave., Archt.